

Supplementary Information

Quantum computing formulation of some classical Hadamard matrix searching methods and its implementation on a quantum computer

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Hadamard Matrices Found by Williamson Based Quantum Computing Method.

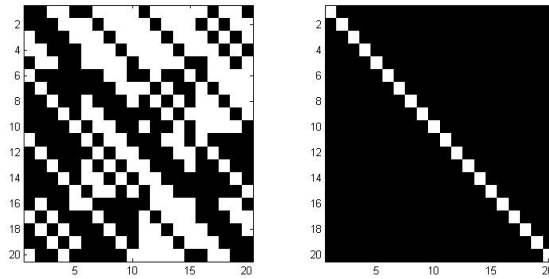


Fig. S.1. H-matrix of order 20: left part is the H-matrix (white=+1, black=-1), right part is indicator matrix (black=0, white=20).

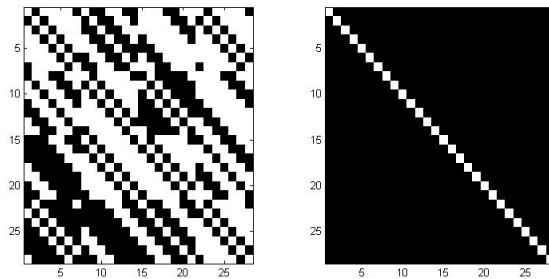


Fig. S.2. H-matrix of order 28: left part is the H-matrix (white= +1, black=-1), right part is indicator matrix (black=0, white=28).

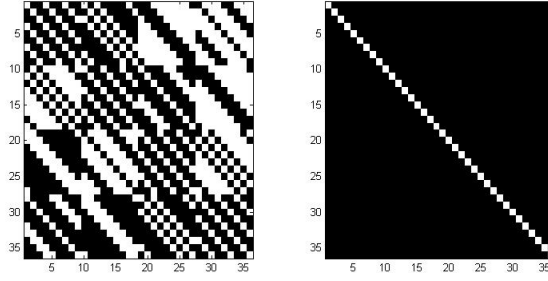


Fig. S.3. H-matrix of order 36: left part is the H-matrix (white=+1, black=-1), right part is indicator matrix (black=0, white=36).

Hadamard Matrices Found by Baumert-Hall Based Quantum Computing Method.

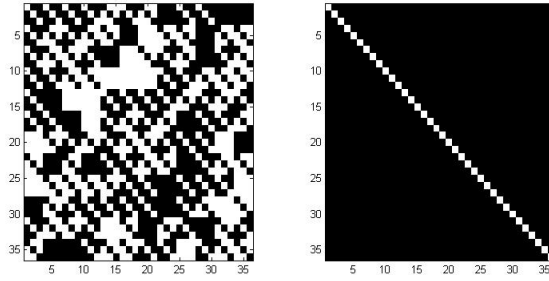


Fig. S.4. H-matrix of order 36: left part is the H-matrix (white=+1, black=-1), right part is indicator matrix (black=0, white=36).

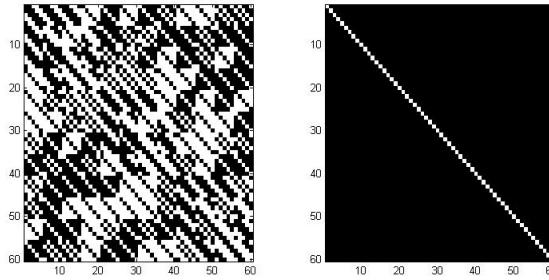


Fig. S.5. H-matrix of order 60: left part is the H-matrix (white=+1, black=-1), right part is indicator matrix (black=0, white=60).

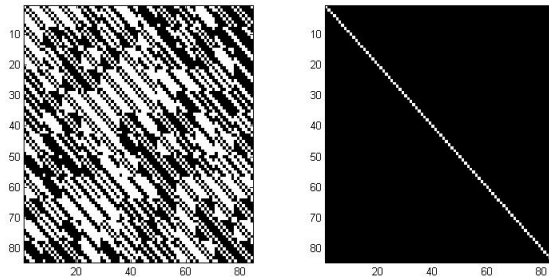


Fig. S.6. H-matrix of order 84: left part is the H-matrix (white=+1, black=-1), right part is indicator matrix (black=0, white=84).

Hadamard Matrices Found by Turyn's Based Quantum Computing Method.

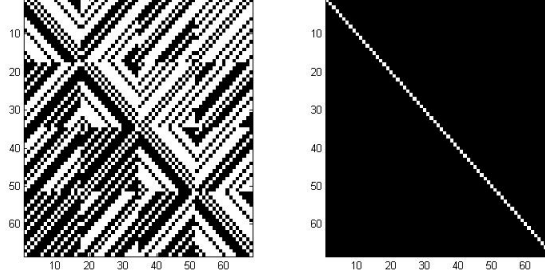


Fig. S.7. H-matrix of order 68: left part is the H-matrix (white=+1, black=-1), right part is indicator matrix (black=0, white=68).

Complete Expressions in The Williamson (and Baumert-Hall)'s Based Method

A complete expression of $E_k(s)$ for 12-order Williamson based method or 36-order Baumert-Hall based method

$$E_k(s) = 96s_0s_1 + 96s_2s_3 + 96s_4s_5 + 96s_6s_7 + 48s_0s_1s_2s_3 + 48s_0s_1s_4s_5 + 48s_0s_1s_6s_7 + 48s_2s_3s_4s_5 + 48s_2s_3s_6s_7 + 48s_4s_5s_6s_7 + 192$$

A complete expression of $E_k(q)$ for 12-order Williamson based method or 36-order Baumert-Hall based method

$$E_k(q) = 960q_0q_1 - 480q_1 - 480q_2 - 480q_3 - 480q_4 - 480q_5 - 480q_6 - 480q_7 - 480q_0 + 192q_0q_2 + 192q_0q_3 + 192q_1q_2 + 192q_0q_4 + 192q_1q_3 + 192q_0q_5 + 192q_1q_4 + 960q_2q_3 + 192q_0q_6 + 192q_1q_5 + 192q_2q_4 + 192q_0q_7 + 192q_1q_6 + 192q_2q_5 + 192q_3q_4 + 192q_1q_7 + 192q_2q_6 + 192q_3q_5 + 192q_2q_7 + 192q_3q_6 + 960q_4q_5 + 192q_3q_7 + 192q_4q_6 + 192q_4q_7 + 192q_5q_6 + 192q_5q_7 + 960q_6q_7 - 384q_0q_1q_2 - 384q_0q_1q_3 - 384q_0q_1q_4 - 384q_0q_2q_3 - 384q_0q_1q_5 - 384q_1q_2q_3 - 384q_0q_1q_6 - 384q_0q_1q_7 - 384q_0q_4q_5 - 384q_2q_3q_4 - 384q_1q_4q_5 - 384q_2q_3q_5 - 384q_2q_3q_6 - 384q_2q_4q_5 - 384q_2q_3q_7 - 384q_3q_4q_5 - 384q_0q_6q_7 - 384q_1q_6q_7 - 384q_2q_6q_7 - 384q_4q_5q_6 - 384q_3q_6q_7 - 384q_4q_5q_7 - 384q_4q_6q_7 - 384q_5q_6q_7 + 768q_0q_1q_2q_3 + 768q_0q_1q_4q_5 + 768q_0q_1q_6q_7 + 768q_2q_3q_4q_5 + 768q_2q_3q_6q_7 + 768q_4q_5q_6q_7 + 864$$

A complete expression of $E_2(q)$ for 12-order Williamson based method or 36-order Baumert-Hall based method by taking $\delta = 53, 952$

$$E_2(q) = 162816q_8 - 480q_1 - 480q_2 - 480q_3 - 480q_4 - 480q_5 - 480q_6 - 480q_7 - 480q_0 + 162816q_9 + 162816q_{10} + 162816q_{11} + 53952q_0q_1 + 192q_0q_2 + 192q_0q_3 + 192q_1q_2 + 192q_0q_4 + 192q_1q_3 + 192q_0q_5 + 192q_1q_4 + 53952q_2q_3 + 192q_0q_6 + 192q_1q_5 + 192q_2q_4 + 192q_0q_7 + 192q_1q_6 + 192q_2q_5 + 192q_3q_4 - 107904q_0q_8 + 192q_1q_7 + 192q_2q_6 + 192q_3q_5 - 384q_0q_9 - 107904q_1q_8 + 192q_2q_7 + 192q_3q_6 + 53952q_4q_5 - 384q_0q_{10} - 384q_1q_9 - 384q_2q_8 + 192q_3q_7 + 192q_4q_6 - 384q_0q_{11} - 384q_1q_{10} - 107904q_2q_9 - 384q_3q_8 + 192q_4q_7 + 192q_5q_6 - 384q_1q_{11} - 384q_2q_{10} - 107904q_3q_9 - 384q_4q_8 + 192q_5q_7 - 384q_2q_{11} - 384q_3q_{10} - 384q_4q_9 - 384q_5q_8 + 53952q_6q_7 - 384q_3q_{11} - 107904q_4q_{10} - 384q_5q_9 - 384q_6q_8 - 384q_4q_{11} - 107904q_5q_{10} - 384q_6q_9 - 384q_7q_8 - 384q_5q_{11} - 384q_6q_{10} - 384q_7q_9 - 107904q_6q_{11} - 384q_7q_{10} + 768q_8q_9 - 107904q_7q_{11} + 768q_8q_{10} + 768q_8q_{11} + 768q_9q_{10} + 768q_9q_{11} + 768q_{10}q_{11} + 864$$

A complete expression of $E_2(s)$ for 12-order Williamson based method or 36-order Baumert-Hall based method

$$E_2(s) = 13728s_0 + 13728s_1 + 13728s_2 + 13728s_3 + 13728s_4 + 13728s_5 + 13728s_6 + 13728s_7 - 27456s_8 - 27456s_9 - 27456s_{10} - 27456s_{11} + 13488s_0s_1 + 48s_0s_2 + 48s_0s_3 + 48s_1s_2 + 48s_0s_4 + 48s_1s_3 + 48s_0s_5 + 48s_1s_4 + 13488s_2s_3 + 48s_0s_6 + 48s_1s_5 + 48s_2s_4 + 48s_0s_7 + 48s_1s_6 + 48s_2s_5 + 48s_3s_4 - 26976s_0s_8 + 48s_1s_7 + 48s_2s_6 + 48s_3s_5 - 96s_0s_9 - 26976s_1s_8 + 48s_2s_7 + 48s_3s_6 + 13488s_4s_5 - 96s_0s_{10} - 96s_1s_9 - 96s_2s_8 + 48s_3s_7 + 48s_4s_6 - 96s_0s_{11} - 96s_1s_{10} - 26976s_2s_9 - 96s_3s_8 + 48s_4s_7 + 48s_5s_6 - 96s_1s_{11} - 96s_2s_{10} - 26976s_3s_9 - 96s_4s_8 + 48s_5s_7 - 96s_2s_{11} - 96s_3s_{10} - 96s_4s_9 - 96s_5s_8 + 13488s_6s_7 - 96s_3s_{11} - 26976s_4s_{10} - 96s_5s_9 - 96s_6s_8 - 96s_4s_{11} - 26976s_5s_{10} - 96s_6s_9 - 96s_7s_8 - 96s_5s_{11} - 96s_6s_{10} - 96s_7s_9 - 26976s_6s_{11} - 96s_7s_{10} + 192s_8s_9 - 26976s_7s_{11} + 192s_8s_{10} + 192s_8s_{11} + 192s_9s_{10} + 192s_9s_{11} + 192s_{10}s_{11} + 162720$$

A complete expression of $\hat{H}_2(\hat{\sigma}^z)$ for 12-order Williamson based method or 36-order Baumert-Hall based method

$$\hat{H}_2(\hat{\sigma}^z) = 13728\hat{\sigma}_0^z + 13728\hat{\sigma}_1^z + 13728\hat{\sigma}_2^z + 13728\hat{\sigma}_3^z + 13728\hat{\sigma}_4^z + 13728\hat{\sigma}_5^z + 13728\hat{\sigma}_6^z + 13728\hat{\sigma}_7^z - 27456\hat{\sigma}_8^z - 27456\hat{\sigma}_9^z - 27456\hat{\sigma}_{10}^z - 27456\hat{\sigma}_{11}^z + 13488\hat{\sigma}_0^z\hat{\sigma}_1^z + 48\hat{\sigma}_0^z\hat{\sigma}_2^z + 48\hat{\sigma}_0^z\hat{\sigma}_3^z + 48\hat{\sigma}_1^z\hat{\sigma}_2^z + 48\hat{\sigma}_0^z\hat{\sigma}_4^z + 48\hat{\sigma}_1^z\hat{\sigma}_3^z + 48\hat{\sigma}_0^z\hat{\sigma}_5^z + 48\hat{\sigma}_1^z\hat{\sigma}_4^z + 13488\hat{\sigma}_2^z\hat{\sigma}_3^z + 48\hat{\sigma}_0^z\hat{\sigma}_6^z + 48\hat{\sigma}_1^z\hat{\sigma}_5^z + 48\hat{\sigma}_2^z\hat{\sigma}_4^z + 48\hat{\sigma}_0^z\hat{\sigma}_7^z + 48\hat{\sigma}_1^z\hat{\sigma}_6^z + 48\hat{\sigma}_2^z\hat{\sigma}_5^z + 48\hat{\sigma}_3^z\hat{\sigma}_4^z - 26976\hat{\sigma}_0^z\hat{\sigma}_8^z + 48\hat{\sigma}_1^z\hat{\sigma}_7^z + 48\hat{\sigma}_2^z\hat{\sigma}_6^z + 48\hat{\sigma}_3^z\hat{\sigma}_5^z - 96\hat{\sigma}_0^z\hat{\sigma}_9^z - 26976\hat{\sigma}_1^z\hat{\sigma}_8^z + 48\hat{\sigma}_2^z\hat{\sigma}_7^z + 48\hat{\sigma}_3^z\hat{\sigma}_6^z + 13488\hat{\sigma}_4^z\hat{\sigma}_5^z -$$

$$\begin{aligned}
& 96\hat{\sigma}_0^z\hat{\sigma}_{10}^z - 96\hat{\sigma}_1^z\hat{\sigma}_9^z - 96\hat{\sigma}_2^z\hat{\sigma}_8^z + 48\hat{\sigma}_3^z\hat{\sigma}_7^z + 48\hat{\sigma}_4^z\hat{\sigma}_6^z - 96\hat{\sigma}_0^z\hat{\sigma}_{11}^z - 96\hat{\sigma}_1^z\hat{\sigma}_{10}^z - 26976\hat{\sigma}_2^z\hat{\sigma}_9^z - 96\hat{\sigma}_3^z\hat{\sigma}_8^z + 48\hat{\sigma}_4^z\hat{\sigma}_7^z + \\
& 48\hat{\sigma}_5^z\hat{\sigma}_6^z - 96\hat{\sigma}_1^z\hat{\sigma}_{11}^z - 96\hat{\sigma}_2^z\hat{\sigma}_{10}^z - 26976\hat{\sigma}_3^z\hat{\sigma}_9^z - 96\hat{\sigma}_4^z\hat{\sigma}_8^z + 48\hat{\sigma}_5^z\hat{\sigma}_7^z - 96\hat{\sigma}_2^z\hat{\sigma}_{11}^z - 96\hat{\sigma}_3^z\hat{\sigma}_{10}^z - 96\hat{\sigma}_4^z\hat{\sigma}_9^z - 96\hat{\sigma}_5^z\hat{\sigma}_8^z + \\
& 13488\hat{\sigma}_6^z\hat{\sigma}_7^z - 96\hat{\sigma}_3^z\hat{\sigma}_{11}^z - 26976\hat{\sigma}_4^z\hat{\sigma}_{10}^z - 96\hat{\sigma}_5^z\hat{\sigma}_9^z - 96\hat{\sigma}_6^z\hat{\sigma}_8^z - 96\hat{\sigma}_4^z\hat{\sigma}_{11}^z - 26976\hat{\sigma}_5^z\hat{\sigma}_{10}^z - 96\hat{\sigma}_6^z\hat{\sigma}_9^z - 96\hat{\sigma}_7^z\hat{\sigma}_8^z - \\
& 96\hat{\sigma}_5^z\hat{\sigma}_{11}^z - 96\hat{\sigma}_6^z\hat{\sigma}_{10}^z - 96\hat{\sigma}_7^z\hat{\sigma}_9^z - 26976\hat{\sigma}_6^z\hat{\sigma}_{11}^z - 96\hat{\sigma}_7^z\hat{\sigma}_{10}^z + 192\hat{\sigma}_8^z\hat{\sigma}_9^z - 26976\hat{\sigma}_7^z\hat{\sigma}_{11}^z + 192\hat{\sigma}_8^z\hat{\sigma}_{10}^z + 192\hat{\sigma}_8^z\hat{\sigma}_{11}^z + \\
& 192\hat{\sigma}_9^z\hat{\sigma}_{10}^z + 192\hat{\sigma}_9^z\hat{\sigma}_{11}^z + 192\hat{\sigma}_{10}^z\hat{\sigma}_{11}^z + 162720
\end{aligned}$$

A complete expression of $E_k(s)$ for 20-order Williamson based method or 60-order Baumert-Hall based method

$$E_k(s) = 240s_0s_1 + 240s_0s_2 + 320s_1s_2 + 240s_3s_4 + 240s_3s_5 + 320s_4s_5 + 240s_6s_7 + 240s_6s_8 + 320s_7s_8 + 240s_9s_{10} + 240s_9s_{11} + 320s_{10}s_{11} + 80s_0s_1s_3s_4 + 80s_0s_1s_4s_5 + 80s_0s_2s_3s_5 + 80s_1s_2s_3s_4 + 80s_0s_2s_4s_5 + 80s_1s_2s_3s_5 + 160s_1s_2s_4s_5 + 80s_0s_1s_6s_7 + 80s_0s_1s_7s_8 + 80s_0s_2s_6s_8 + 80s_1s_2s_6s_7 + 80s_0s_2s_7s_8 + 80s_1s_2s_6s_8 + 160s_1s_2s_7s_8 + 80s_0s_1s_9s_{10} + 80s_3s_4s_6s_7 + 80s_0s_1s_{10}s_{11} + 80s_0s_2s_9s_{11} + 80s_1s_2s_9s_{10} + 80s_3s_4s_7s_8 + 80s_3s_5s_6s_8 + 80s_4s_5s_6s_7 + 80s_0s_2s_{10}s_{11} + 80s_1s_2s_9s_{11} + 80s_3s_5s_7s_8 + 80s_4s_5s_6s_8 + 160s_1s_2s_{10}s_{11} + 160s_4s_5s_7s_8 + 80s_3s_4s_9s_{10} + 80s_3s_4s_{10}s_{11} + 80s_3s_5s_9s_{11} + 80s_4s_5s_9s_{10} + 80s_3s_5s_{10}s_{11} + 80s_4s_5s_9s_{11} + 160s_4s_5s_{10}s_{11} + 80s_6s_7s_9s_{10} + 80s_6s_7s_{10}s_{11} + 80s_6s_8s_9s_{11} + 80s_7s_8s_9s_{10} + 80s_6s_8s_{10}s_{11} + 80s_7s_8s_9s_{11} + 160s_7s_8s_{10}s_{11} + 960$$

A complete expression of $E_k(q)$ for 20-order Williamson based method or 60-order Baumert-Hall based method by taking $\delta = 681, 600$

$$E_k(q) = 2880q_0q_1 - 4000q_1 - 4000q_2 - 2880q_3 - 4000q_4 - 4000q_5 - 2880q_6 - 4000q_7 - 4000q_8 - 2880q_9 - 4000q_{10} - 4000q_{11} - 2880q_0 + 2880q_0q_2 + 640q_0q_3 + 5120q_1q_2 + 960q_0q_4 + 960q_1q_3 + 960q_0q_5 + 1600q_1q_4 + 960q_2q_3 + 640q_0q_6 + 1280q_1q_5 + 1280q_2q_4 + 960q_0q_7 + 960q_1q_6 + 1600q_2q_5 + 2880q_3q_4 + 960q_0q_8 + 1600q_1q_7 + 960q_2q_6 + 2880q_3q_5 + 640q_0q_9 + 1280q_1q_8 + 1280q_2q_7 + 640q_3q_6 + 5120q_4q_5 + 960q_0q_{10} + 960q_1q_9 + 1600q_2q_8 + 960q_3q_7 + 960q_4q_6 + 960q_0q_{11} + 1600q_1q_{10} + 960q_2q_9 + 960q_3q_8 + 1600q_4q_7 + 960q_5q_6 + 1280q_1q_{11} + 1280q_2q_{10} + 640q_3q_9 + 1280q_4q_8 + 1280q_5q_7 + 1600q_2q_{11} + 960q_3q_{10} + 960q_4q_9 + 1600q_5q_8 + 2880q_6q_7 + 960q_3q_{11} + 1600q_4q_{10} + 960q_5q_9 + 2880q_6q_8 + 1280q_4q_{11} + 1280q_5q_{10} + 640q_6q_9 + 5120q_7q_8 + 1600q_5q_{11} + 960q_6q_{10} + 960q_7q_9 + 960q_6q_{11} + 1600q_7q_{10} + 960q_8q_9 + 1280q_7q_{11} + 1280q_8q_{10} + 1600q_8q_{11} + 2880q_9q_{10} + 2880q_9q_{11} + 5120q_{10}q_{11} - 640q_0q_1q_3 - 1280q_0q_1q_4 - 640q_0q_2q_3 - 640q_0q_1q_5 - 640q_0q_2q_4 - 1280q_1q_2q_3 - 640q_0q_1q_6 - 1280q_0q_2q_5 - 640q_0q_3q_4 - 1920q_1q_2q_4 - 1280q_0q_1q_7 - 640q_0q_2q_6 - 640q_0q_3q_5 - 1920q_1q_2q_5 - 1280q_1q_3q_4 - 640q_0q_1q_8 - 640q_0q_2q_7 - 1280q_0q_4q_5 - 1280q_1q_2q_6 - 640q_1q_3q_5 - 640q_2q_3q_4 - 640q_0q_1q_9 - 1280q_0q_2q_8 - 1920q_1q_2q_7 - 1920q_1q_4q_5 - 1280q_2q_3q_5 - 1280q_0q_1q_{10} - 640q_0q_2q_9 - 1920q_1q_2q_8 - 1920q_2q_4q_5 - 640q_0q_1q_{11} - 640q_0q_2q_{10} - 1280q_1q_2q_9 - 1280q_0q_2q_{11} - 640q_0q_6q_7 - 1920q_1q_2q_{10} - 640q_3q_4q_6 - 640q_0q_6q_8 - 1920q_1q_2q_{11} - 1280q_1q_6q_7 - 1280q_3q_4q_7 - 640q_3q_5q_6 - 1280q_0q_7q_8 - 640q_1q_6q_8 - 640q_2q_6q_7 - 640q_3q_4q_8 - 640q_3q_5q_7 - 1280q_4q_5q_6 - 1920q_1q_7q_8 - 1280q_2q_6q_8 - 640q_3q_4q_9 - 1280q_3q_5q_8 - 640q_3q_6q_7 - 1920q_4q_5q_7 - 1920q_2q_7q_8 - 1280q_3q_4q_{10} - 640q_3q_5q_9 - 640q_3q_6q_8 - 1920q_4q_5q_8 - 1280q_4q_6q_7 - 640q_3q_4q_{11} - 640q_3q_5q_{10} - 1280q_3q_7q_8 - 1280q_4q_5q_9 - 640q_4q_6q_8 - 640q_5q_6q_7 - 640q_0q_9q_{10} - 1280q_3q_5q_{11} - 1920q_4q_5q_{10} - 1920q_4q_7q_8 - 1280q_5q_6q_8 - 640q_0q_9q_{11} - 1280q_1q_9q_{10} - 1920q_4q_5q_{11} - 1920q_5q_7q_8 - 1280q_0q_{10}q_{11} - 640q_1q_9q_{11} - 640q_2q_9q_{10} - 1920q_1q_{10}q_{11} - 1280q_2q_9q_{11} - 640q_3q_9q_{10} - 640q_6q_7q_9 - 1920q_2q_{10}q_{11} - 640q_3q_9q_{11} - 1280q_4q_9q_{10} - 1280q_6q_7q_{10} - 640q_6q_8q_9 - 1280q_3q_{10}q_{11} - 640q_4q_9q_{11} - 640q_5q_9q_{10} - 640q_6q_7q_{11} - 640q_6q_8q_{10} - 1280q_7q_8q_9 - 1920q_4q_{10}q_{11} - 1280q_5q_9q_{11} - 1280q_6q_8q_{11} - 640q_6q_9q_{10} - 1920q_7q_8q_{10} - 1920q_5q_{10}q_{11} - 640q_6q_9q_{11} - 1920q_7q_8q_{11} - 1280q_7q_9q_{10} - 1280q_6q_{10}q_{11} - 640q_7q_9q_{11} - 640q_8q_9q_{10} - 1920q_7q_{10}q_{11} - 1280q_8q_9q_{11} - 1920q_8q_{10}q_{11} + 1280q_0q_1q_3q_4 + 1280q_0q_1q_4q_5 + 1280q_0q_2q_3q_5 + 1280q_1q_2q_3q_4 + 1280q_0q_2q_4q_5 + 1280q_1q_2q_3q_5 + 2560q_1q_2q_4q_5 + 1280q_0q_1q_6q_7 + 1280q_0q_1q_7q_8 + 1280q_0q_2q_6q_8 + 1280q_1q_2q_6q_7 + 1280q_0q_2q_7q_8 + 1280q_1q_2q_6q_8 + 2560q_1q_2q_7q_8 + 1280q_0q_1q_9q_{10} + 1280q_3q_4q_6q_7 + 1280q_0q_1q_{10}q_{11} + 1280q_0q_2q_9q_{11} + 1280q_1q_2q_9q_{10} + 1280q_3q_4q_7q_8 + 1280q_3q_5q_6q_8 + 1280q_4q_5q_6q_7 + 1280q_0q_2q_{10}q_{11} + 1280q_1q_2q_9q_{11} + 1280q_3q_5q_7q_8 + 1280q_4q_5q_6q_8 + 2560q_1q_2q_{10}q_{11} + 2560q_4q_5q_7q_8 + 1280q_3q_4q_9q_{10} + 1280q_3q_4q_{10}q_{11} + 1280q_3q_5q_9q_{11} + 1280q_4q_5q_9q_{10} + 1280q_3q_5q_{10}q_{11} + 1280q_4q_5q_9q_{11} + 2560q_4q_5q_{10}q_{11} + 1280q_6q_7q_9q_{10} + 1280q_6q_7q_{10}q_{11} + 1280q_6q_8q_9q_{11} + 1280q_7q_8q_9q_{10} + 1280q_6q_8q_{10}q_{11} + 1280q_7q_8q_9q_{11} + 2560q_7q_8q_{10}q_{11} + 8000$$

A complete expression of $E_2(q)$ for 20-order Williamson based method or 60-order Baumert-Hall based method

$$E_2(q) = 2047680q_{12} - 4000q_1 - 4000q_2 - 2880q_3 - 4000q_4 - 4000q_5 - 2880q_6 - 4000q_7 - 4000q_8 - 2880q_9 - 4000q_{10} - 4000q_{11} - 2880q_0 + 2047680q_{13} + 2049920q_{14} + 2047680q_{15} + 2047680q_{16} + 2049920q_{17} +$$

$$\begin{aligned}
& 2047680q_{18} + 2047680q_{19} + 2049920q_{20} + 2047680q_{21} + 2047680q_{22} + 2049920q_{23} + 681600q_0q_1 + \\
& 681600q_0q_2 + 640q_0q_3 + 681600q_1q_2 + 960q_0q_4 + 960q_1q_3 + 960q_0q_5 + 1600q_1q_4 + 960q_2q_3 + 640q_0q_6 + \\
& 1280q_1q_5 + 1280q_2q_4 + 960q_0q_7 + 960q_1q_6 + 1600q_2q_5 + 681600q_3q_4 + 960q_0q_8 + 1600q_1q_7 + 960q_2q_6 + \\
& 681600q_3q_5 + 640q_0q_9 + 1280q_1q_8 + 1280q_2q_7 + 640q_3q_6 + 681600q_4q_5 + 960q_0q_{10} + 960q_1q_9 + 1600q_2q_8 + \\
& 960q_3q_7 + 960q_4q_6 + 960q_0q_{11} + 1600q_1q_{10} + 960q_2q_9 + 960q_3q_8 + 1600q_4q_7 + 960q_5q_6 - 1363200q_0q_{12} + \\
& 1280q_1q_{11} + 1280q_2q_{10} + 640q_3q_9 + 1280q_4q_8 + 1280q_5q_7 - 1363200q_0q_{13} - 1363200q_1q_{12} + 1600q_2q_{11} + \\
& 960q_3q_{10} + 960q_4q_9 + 1600q_5q_8 + 681600q_6q_7 + 960q_3q_{11} + 1600q_4q_{10} + 960q_5q_9 + 681600q_6q_8 - 640q_0q_{15} - \\
& 1363200q_1q_{14} - 1363200q_2q_{13} - 640q_3q_{12} + 1280q_4q_{11} + 1280q_5q_{10} + 640q_6q_9 + 681600q_7q_8 - 640q_0q_{16} - \\
& 1280q_1q_{15} - 1363200q_2q_{14} - 640q_3q_{13} - 1280q_4q_{12} + 1600q_5q_{11} + 960q_6q_{10} + 960q_7q_9 - 1280q_0q_{17} - \\
& 640q_1q_{16} - 640q_2q_{15} - 1280q_3q_{14} - 640q_4q_{13} - 640q_5q_{12} + 960q_6q_{11} + 1600q_7q_{10} + 960q_8q_9 - 640q_0q_{18} - \\
& 1920q_1q_{17} - 1280q_2q_{16} - 1363200q_3q_{15} - 1920q_4q_{14} - 1280q_5q_{13} - 640q_6q_{12} + 1280q_7q_{11} + 1280q_8q_{10} - \\
& 640q_0q_{19} - 1280q_1q_{18} - 1920q_2q_{17} - 1363200q_3q_{16} - 1363200q_4q_{15} - 1920q_5q_{14} - 640q_6q_{13} - 1280q_7q_{12} + \\
& 1600q_8q_{11} + 681600q_9q_{10} - 1280q_0q_{20} - 640q_1q_{19} - 640q_2q_{18} - 1280q_6q_{14} - 640q_7q_{13} - 640q_8q_{12} + \\
& 681600q_9q_{11} - 640q_0q_{21} - 1920q_1q_{20} - 1280q_2q_{19} - 640q_3q_{18} - 1363200q_4q_{17} - 1363200q_5q_{16} - 640q_6q_{15} - \\
& 1920q_7q_{14} - 1280q_8q_{13} - 640q_9q_{12} + 681600q_{10}q_{11} - 640q_0q_{22} - 1280q_1q_{21} - 1920q_2q_{20} - 640q_3q_{19} - \\
& 1280q_4q_{18} - 1363200q_5q_{17} - 640q_6q_{16} - 1280q_7q_{15} - 1920q_8q_{14} - 640q_9q_{13} - 1280q_{10}q_{12} - 1280q_0q_{23} - \\
& 640q_1q_{22} - 640q_2q_{21} - 1280q_3q_{20} - 640q_4q_{19} - 640q_5q_{18} - 1280q_6q_{17} - 640q_7q_{16} - 640q_8q_{15} - 1280q_9q_{14} - \\
& 640q_{10}q_{13} - 640q_{11}q_{12} - 1920q_1q_{23} - 1280q_2q_{22} - 640q_3q_{21} - 1920q_4q_{20} - 1280q_5q_{19} - 1363200q_6q_{18} - \\
& 1920q_7q_{17} - 1280q_8q_{16} - 640q_9q_{15} - 1920q_{10}q_{14} - 1280q_{11}q_{13} - 1920q_2q_{23} - 640q_3q_{22} - 1280q_4q_{21} - \\
& 1920q_5q_{20} - 1363200q_6q_{19} - 1363200q_7q_{18} - 1920q_8q_{17} - 640q_9q_{16} - 1280q_{10}q_{15} - 1920q_{11}q_{14} - \\
& 1280q_3q_{23} - 640q_4q_{22} - 640q_5q_{21} - 1280q_9q_{17} - 640q_{10}q_{16} - 640q_{11}q_{15} - 1920q_4q_{23} - 1280q_5q_{22} - \\
& 640q_6q_{21} - 1363200q_7q_{20} - 1363200q_8q_{19} - 640q_9q_{18} - 1920q_{10}q_{17} - 1280q_{11}q_{16} + 1280q_{12}q_{15} - 1920q_5q_{23} - \\
& 640q_6q_{22} - 1280q_7q_{21} - 1363200q_8q_{20} - 640q_9q_{19} - 1280q_{10}q_{18} - 1920q_{11}q_{17} - 1280q_6q_{23} - 640q_7q_{22} - \\
& 640q_8q_{21} - 1280q_9q_{20} - 640q_{10}q_{19} - 640q_{11}q_{18} + 1280q_{12}q_{17} + 1280q_{13}q_{16} + 1280q_{14}q_{15} - 1920q_7q_{23} - \\
& 1280q_8q_{22} - 1363200q_9q_{21} - 1920q_{10}q_{20} - 1280q_{11}q_{19} + 1280q_{12}q_{18} + 1280q_{13}q_{17} + 1280q_{14}q_{16} - 1920q_8q_{23} - \\
& 1363200q_9q_{22} - 1363200q_{10}q_{21} - 1920q_{11}q_{20} + 2560q_{14}q_{17} + 1280q_{12}q_{20} + 1280q_{13}q_{19} + 1280q_{14}q_{18} - \\
& 1363200q_{10}q_{23} - 1363200q_{11}q_{22} + 1280q_{12}q_{21} + 1280q_{13}q_{20} + 1280q_{14}q_{19} + 1280q_{15}q_{18} - 1363200q_{11}q_{23} + \\
& 2560q_{14}q_{20} + 1280q_{12}q_{23} + 1280q_{13}q_{22} + 1280q_{14}q_{21} + 1280q_{15}q_{20} + 1280q_{16}q_{19} + 1280q_{17}q_{18} + 1280q_{13}q_{23} + \\
& 1280q_{14}q_{22} + 1280q_{15}q_{21} + 1280q_{16}q_{20} + 1280q_{17}q_{19} + 2560q_{14}q_{23} + 2560q_{17}q_{20} + 1280q_{15}q_{23} + 1280q_{16}q_{22} + \\
& 1280q_{17}q_{21} + 1280q_{16}q_{23} + 1280q_{17}q_{22} + 1280q_{18}q_{21} + 2560q_{17}q_{23} + 1280q_{18}q_{23} + 1280q_{19}q_{22} + 1280q_{20}q_{21} + \\
& 1280q_{19}q_{23} + 1280q_{20}q_{22} + 2560q_{20}q_{23} + 8000
\end{aligned}$$

A complete expression of $E_2(s)$ for 20-order Williamson based method or 60-order Baumert-Hall based method

$$\begin{aligned}
E_2(s) = & 342240s_0 + 342800s_1 + 342800s_2 + 342240s_3 + 342800s_4 + 342800s_5 + 342240s_6 + 342800s_7 + \\
& 342800s_8 + 342240s_9 + 342800s_{10} + 342800s_{11} - 342240s_{12} - 342240s_{13} - 343360s_{14} - 342240s_{15} - 342240s_{16} - \\
& 343360s_{17} - 342240s_{18} - 342240s_{19} - 343360s_{20} - 342240s_{21} - 342240s_{22} - 343360s_{23} + 170400s_0s_1 + \\
& 170400s_0s_2 + 160s_0s_3 + 170400s_1s_2 + 240s_0s_4 + 240s_1s_3 + 240s_0s_5 + 400s_1s_4 + 240s_2s_3 + 160s_0s_6 + 320s_1s_5 + \\
& 320s_2s_4 + 240s_0s_7 + 240s_1s_6 + 400s_2s_5 + 170400s_3s_4 + 240s_0s_8 + 400s_1s_7 + 240s_2s_6 + 170400s_3s_5 + 160s_0s_9 + \\
& 320s_1s_8 + 320s_2s_7 + 160s_3s_6 + 170400s_4s_5 + 240s_0s_{10} + 240s_1s_9 + 400s_2s_8 + 240s_3s_7 + 240s_4s_6 + 240s_0s_{11} + \\
& 400s_1s_{10} + 240s_2s_9 + 240s_3s_8 + 400s_4s_7 + 240s_5s_6 - 340800s_0s_{12} + 320s_1s_{11} + 320s_2s_{10} + 160s_3s_9 + 320s_4s_8 + \\
& 320s_5s_7 - 340800s_0s_{13} - 340800s_1s_{12} + 400s_2s_{11} + 240s_3s_{10} + 240s_4s_9 + 400s_5s_8 + 170400s_6s_7 + 240s_3s_{11} + \\
& 400s_4s_{10} + 240s_5s_9 + 170400s_6s_8 - 160s_0s_{15} - 340800s_1s_{14} - 340800s_2s_{13} - 160s_3s_{12} + 320s_4s_{11} + 320s_5s_{10} + \\
& 160s_6s_9 + 170400s_7s_8 - 160s_0s_{16} - 320s_1s_{15} - 340800s_2s_{14} - 160s_3s_{13} - 320s_4s_{12} + 400s_5s_{11} + 240s_6s_{10} + \\
& 240s_7s_9 - 320s_0s_{17} - 160s_1s_{16} - 160s_2s_{15} - 320s_3s_{14} - 160s_4s_{13} - 160s_5s_{12} + 240s_6s_{11} + 400s_7s_{10} + 240s_8s_9 - \\
& 160s_0s_{18} - 480s_1s_{17} - 320s_2s_{16} - 340800s_3s_{15} - 480s_4s_{14} - 320s_5s_{13} - 160s_6s_{12} + 320s_7s_{11} + 320s_8s_{10} - \\
& 160s_0s_{19} - 320s_1s_{18} - 480s_2s_{17} - 340800s_3s_{16} - 340800s_4s_{15} - 480s_5s_{14} - 160s_6s_{13} - 320s_7s_{12} + 400s_8s_{11} + \\
& 170400s_9s_{10} - 320s_0s_{20} - 160s_1s_{19} - 160s_2s_{18} - 320s_6s_{14} - 160s_7s_{13} - 160s_8s_{12} + 170400s_9s_{11} - 160s_0s_{21} -
\end{aligned}$$

$$\begin{aligned}
& 480s_1s_{20} - 320s_2s_{19} - 160s_3s_{18} - 340800s_4s_{17} - 340800s_5s_{16} - 160s_6s_{15} - 480s_7s_{14} - 320s_8s_{13} - 160s_9s_{12} + \\
& 170400s_{10}s_{11} - 160s_{10}s_{22} - 320s_{11}s_{21} - 480s_2s_{20} - 160s_3s_{19} - 320s_4s_{18} - 340800s_5s_{17} - 160s_6s_{16} - 320s_7s_{15} - \\
& 480s_8s_{14} - 160s_9s_{13} - 320s_{10}s_{12} - 320s_{10}s_{23} - 160s_{11}s_{22} - 160s_2s_{21} - 320s_3s_{20} - 160s_4s_{19} - 160s_5s_{18} - 320s_6s_{17} - \\
& 160s_7s_{16} - 160s_8s_{15} - 320s_9s_{14} - 160s_{10}s_{13} - 160s_{11}s_{12} - 480s_1s_{23} - 320s_2s_{22} - 160s_3s_{21} - 480s_4s_{20} - 320s_5s_{19} - \\
& 340800s_6s_{18} - 480s_7s_{17} - 320s_8s_{16} - 160s_9s_{15} - 480s_{10}s_{14} - 320s_{11}s_{13} - 480s_2s_{23} - 160s_3s_{22} - 320s_4s_{21} - \\
& 480s_5s_{20} - 340800s_6s_{19} - 340800s_7s_{18} - 480s_8s_{17} - 160s_9s_{16} - 320s_{10}s_{15} - 480s_{11}s_{14} - 320s_3s_{23} - 160s_4s_{22} - \\
& 160s_5s_{21} - 320s_9s_{17} - 160s_{10}s_{16} - 160s_{11}s_{15} - 480s_4s_{23} - 320s_5s_{22} - 160s_6s_{21} - 340800s_7s_{20} - 340800s_8s_{19} - \\
& 160s_9s_{18} - 480s_{10}s_{17} - 320s_{11}s_{16} + 320s_{12}s_{15} - 480s_5s_{23} - 160s_6s_{22} - 320s_7s_{21} - 340800s_8s_{20} - 160s_9s_{19} - \\
& 320s_{10}s_{18} - 480s_{11}s_{17} - 320s_6s_{23} - 160s_7s_{22} - 160s_8s_{21} - 320s_9s_{20} - 160s_{10}s_{19} - 160s_{11}s_{18} + 320s_{12}s_{17} + \\
& 320s_{13}s_{16} + 320s_{14}s_{15} - 480s_7s_{23} - 320s_8s_{22} - 340800s_9s_{21} - 480s_{10}s_{20} - 320s_{11}s_{19} + 320s_{12}s_{18} + 320s_{13}s_{17} + \\
& 320s_{14}s_{16} - 480s_8s_{23} - 340800s_9s_{22} - 340800s_{10}s_{21} - 480s_{11}s_{20} + 640s_{14}s_{17} + 320s_{12}s_{20} + 320s_{13}s_{19} + 320s_{14}s_{18} - \\
& 340800s_{10}s_{23} - 340800s_{11}s_{22} + 320s_{12}s_{21} + 320s_{13}s_{20} + 320s_{14}s_{19} + 320s_{15}s_{18} - 340800s_{11}s_{23} + 640s_{14}s_{20} + \\
& 320s_{12}s_{23} + 320s_{13}s_{22} + 320s_{14}s_{21} + 320s_{15}s_{20} + 320s_{16}s_{19} + 320s_{17}s_{18} + 320s_{13}s_{23} + 320s_{14}s_{22} + 320s_{15}s_{21} + \\
& 320s_{16}s_{20} + 320s_{17}s_{19} + 640s_{14}s_{23} + 640s_{17}s_{20} + 320s_{15}s_{23} + 320s_{16}s_{22} + 320s_{17}s_{21} + 320s_{16}s_{23} + 320s_{17}s_{22} + \\
& 320s_{18}s_{21} + 640s_{17}s_{23} + 320s_{18}s_{23} + 320s_{19}s_{22} + 320s_{20}s_{21} + 320s_{19}s_{23} + 320s_{20}s_{22} + 640s_{20}s_{23} + 6142400
\end{aligned}$$

A complete expression of $\hat{H}_2(\hat{\sigma}^z)$ for 20-order Williamson based method or 60-order Baumert-Hall based method

$$\begin{aligned}
\hat{H}_2(\hat{\sigma}^z) = & 342240\hat{\sigma}_0^z + 342800\hat{\sigma}_1^z + 342800\hat{\sigma}_2^z + 342240\hat{\sigma}_3^z + 342800\hat{\sigma}_4^z + 342800\hat{\sigma}_5^z + 342240\hat{\sigma}_6^z + 342800\hat{\sigma}_7^z + \\
& 342800\hat{\sigma}_8^z + 342240\hat{\sigma}_9^z + 342800\hat{\sigma}_{10}^z + 342800\hat{\sigma}_{11}^z - 342240\hat{\sigma}_{12}^z - 342240\hat{\sigma}_{13}^z - 343360\hat{\sigma}_{14}^z - 342240\hat{\sigma}_{15}^z - \\
& 342240\hat{\sigma}_{16}^z - 343360\hat{\sigma}_{17}^z - 342240\hat{\sigma}_{18}^z - 342240\hat{\sigma}_{19}^z - 343360\hat{\sigma}_{20}^z - 342240\hat{\sigma}_{21}^z - 342240\hat{\sigma}_{22}^z - 343360\hat{\sigma}_{23}^z + \\
& 170400\hat{\sigma}_0^z\hat{\sigma}_1^z + 170400\hat{\sigma}_0^z\hat{\sigma}_2^z + 160\hat{\sigma}_0^z\hat{\sigma}_3^z + 170400\hat{\sigma}_1^z\hat{\sigma}_2^z + 240\hat{\sigma}_0^z\hat{\sigma}_4^z + 240\hat{\sigma}_1^z\hat{\sigma}_3^z + 240\hat{\sigma}_0^z\hat{\sigma}_5^z + 400\hat{\sigma}_1^z\hat{\sigma}_4^z + 240\hat{\sigma}_2^z\hat{\sigma}_3^z + \\
& 160\hat{\sigma}_0^z\hat{\sigma}_6^z + 320\hat{\sigma}_1^z\hat{\sigma}_5^z + 320\hat{\sigma}_2^z\hat{\sigma}_4^z + 240\hat{\sigma}_0^z\hat{\sigma}_7^z + 240\hat{\sigma}_1^z\hat{\sigma}_6^z + 400\hat{\sigma}_2^z\hat{\sigma}_5^z + 170400\hat{\sigma}_3^z\hat{\sigma}_4^z + 240\hat{\sigma}_0^z\hat{\sigma}_8^z + 400\hat{\sigma}_2^z\hat{\sigma}_7^z + \\
& 240\hat{\sigma}_2^z\hat{\sigma}_6^z + 170400\hat{\sigma}_3^z\hat{\sigma}_5^z + 160\hat{\sigma}_0^z\hat{\sigma}_9^z + 320\hat{\sigma}_1^z\hat{\sigma}_8^z + 320\hat{\sigma}_2^z\hat{\sigma}_7^z + 160\hat{\sigma}_3^z\hat{\sigma}_6^z + 170400\hat{\sigma}_4^z\hat{\sigma}_5^z + 240\hat{\sigma}_0^z\hat{\sigma}_{10}^z + 240\hat{\sigma}_1^z\hat{\sigma}_9^z + \\
& 400\hat{\sigma}_2^z\hat{\sigma}_8^z + 240\hat{\sigma}_3^z\hat{\sigma}_7^z + 240\hat{\sigma}_4^z\hat{\sigma}_6^z + 240\hat{\sigma}_0^z\hat{\sigma}_{11}^z + 400\hat{\sigma}_1^z\hat{\sigma}_{10}^z + 240\hat{\sigma}_2^z\hat{\sigma}_9^z + 240\hat{\sigma}_3^z\hat{\sigma}_8^z + 400\hat{\sigma}_4^z\hat{\sigma}_7^z + 240\hat{\sigma}_5^z\hat{\sigma}_6^z - \\
& 340800\hat{\sigma}_0^z\hat{\sigma}_{12}^z + 320\hat{\sigma}_2^z\hat{\sigma}_{11}^z + 320\hat{\sigma}_2^z\hat{\sigma}_{10}^z + 160\hat{\sigma}_3^z\hat{\sigma}_9^z + 320\hat{\sigma}_2^z\hat{\sigma}_8^z + 320\hat{\sigma}_5^z\hat{\sigma}_7^z - 340800\hat{\sigma}_0^z\hat{\sigma}_{13}^z - 340800\hat{\sigma}_1^z\hat{\sigma}_{12}^z + \\
& 400\hat{\sigma}_2^z\hat{\sigma}_{11}^z + 240\hat{\sigma}_3^z\hat{\sigma}_{10}^z + 240\hat{\sigma}_4^z\hat{\sigma}_9^z + 400\hat{\sigma}_5^z\hat{\sigma}_8^z + 170400\hat{\sigma}_6^z\hat{\sigma}_7^z + 240\hat{\sigma}_3^z\hat{\sigma}_{11}^z + 400\hat{\sigma}_4^z\hat{\sigma}_{10}^z + 240\hat{\sigma}_5^z\hat{\sigma}_9^z + 170400\hat{\sigma}_6^z\hat{\sigma}_8^z - \\
& 160\hat{\sigma}_0^z\hat{\sigma}_{15}^z - 340800\hat{\sigma}_1^z\hat{\sigma}_{14}^z - 340800\hat{\sigma}_2^z\hat{\sigma}_{13}^z - 160\hat{\sigma}_3^z\hat{\sigma}_{12}^z + 320\hat{\sigma}_2^z\hat{\sigma}_{11}^z + 320\hat{\sigma}_5^z\hat{\sigma}_{10}^z + 160\hat{\sigma}_6^z\hat{\sigma}_9^z + 170400\hat{\sigma}_7^z\hat{\sigma}_8^z - \\
& 160\hat{\sigma}_0^z\hat{\sigma}_{16}^z - 320\hat{\sigma}_1^z\hat{\sigma}_{15}^z - 340800\hat{\sigma}_2^z\hat{\sigma}_{14}^z - 160\hat{\sigma}_3^z\hat{\sigma}_{13}^z - 320\hat{\sigma}_4^z\hat{\sigma}_{12}^z + 400\hat{\sigma}_5^z\hat{\sigma}_{11}^z + 240\hat{\sigma}_6^z\hat{\sigma}_{10}^z + 240\hat{\sigma}_7^z\hat{\sigma}_9^z - 320\hat{\sigma}_0^z\hat{\sigma}_{17}^z - \\
& 160\hat{\sigma}_1^z\hat{\sigma}_{16}^z - 160\hat{\sigma}_2^z\hat{\sigma}_{15}^z - 320\hat{\sigma}_3^z\hat{\sigma}_{14}^z - 160\hat{\sigma}_4^z\hat{\sigma}_{13}^z - 160\hat{\sigma}_5^z\hat{\sigma}_{12}^z + 240\hat{\sigma}_6^z\hat{\sigma}_{11}^z + 400\hat{\sigma}_7^z\hat{\sigma}_{10}^z + 240\hat{\sigma}_8^z\hat{\sigma}_9^z - 160\hat{\sigma}_0^z\hat{\sigma}_{18}^z - \\
& 480\hat{\sigma}_1^z\hat{\sigma}_{17}^z - 320\hat{\sigma}_2^z\hat{\sigma}_{16}^z - 340800\hat{\sigma}_3^z\hat{\sigma}_{15}^z - 480\hat{\sigma}_4^z\hat{\sigma}_{14}^z - 320\hat{\sigma}_5^z\hat{\sigma}_{13}^z - 160\hat{\sigma}_6^z\hat{\sigma}_{12}^z + 320\hat{\sigma}_7^z\hat{\sigma}_{11}^z + 320\hat{\sigma}_8^z\hat{\sigma}_{10}^z - \\
& 160\hat{\sigma}_0^z\hat{\sigma}_{19}^z - 320\hat{\sigma}_1^z\hat{\sigma}_{18}^z - 480\hat{\sigma}_2^z\hat{\sigma}_{17}^z - 340800\hat{\sigma}_3^z\hat{\sigma}_{16}^z - 340800\hat{\sigma}_4^z\hat{\sigma}_{15}^z - 480\hat{\sigma}_5^z\hat{\sigma}_{14}^z - 160\hat{\sigma}_6^z\hat{\sigma}_{13}^z - 320\hat{\sigma}_7^z\hat{\sigma}_{12}^z + \\
& 400\hat{\sigma}_8^z\hat{\sigma}_{11}^z + 170400\hat{\sigma}_9^z\hat{\sigma}_{10}^z - 320\hat{\sigma}_0^z\hat{\sigma}_{20}^z - 160\hat{\sigma}_1^z\hat{\sigma}_{19}^z - 160\hat{\sigma}_2^z\hat{\sigma}_{18}^z - 320\hat{\sigma}_6^z\hat{\sigma}_{14}^z - 160\hat{\sigma}_7^z\hat{\sigma}_{13}^z - 160\hat{\sigma}_8^z\hat{\sigma}_{12}^z + \\
& 170400\hat{\sigma}_9^z\hat{\sigma}_{11}^z - 160\hat{\sigma}_0^z\hat{\sigma}_{21}^z - 480\hat{\sigma}_1^z\hat{\sigma}_{20}^z - 320\hat{\sigma}_2^z\hat{\sigma}_{19}^z - 160\hat{\sigma}_3^z\hat{\sigma}_{18}^z - 340800\hat{\sigma}_4^z\hat{\sigma}_{17}^z - 340800\hat{\sigma}_5^z\hat{\sigma}_{16}^z - 160\hat{\sigma}_6^z\hat{\sigma}_{15}^z - \\
& 480\hat{\sigma}_7^z\hat{\sigma}_{14}^z - 320\hat{\sigma}_8^z\hat{\sigma}_{13}^z - 160\hat{\sigma}_9^z\hat{\sigma}_{12}^z + 170400\hat{\sigma}_{10}^z\hat{\sigma}_{11}^z - 160\hat{\sigma}_0^z\hat{\sigma}_{22}^z - 320\hat{\sigma}_1^z\hat{\sigma}_{21}^z - 480\hat{\sigma}_2^z\hat{\sigma}_{20}^z - 160\hat{\sigma}_3^z\hat{\sigma}_{19}^z - \\
& 320\hat{\sigma}_4^z\hat{\sigma}_{18}^z - 340800\hat{\sigma}_5^z\hat{\sigma}_{17}^z - 160\hat{\sigma}_6^z\hat{\sigma}_{16}^z - 320\hat{\sigma}_7^z\hat{\sigma}_{15}^z - 480\hat{\sigma}_8^z\hat{\sigma}_{14}^z - 160\hat{\sigma}_9^z\hat{\sigma}_{13}^z - 320\hat{\sigma}_{10}^z\hat{\sigma}_{12}^z - 320\hat{\sigma}_0^z\hat{\sigma}_{23}^z - \\
& 160\hat{\sigma}_1^z\hat{\sigma}_{22}^z - 160\hat{\sigma}_2^z\hat{\sigma}_{21}^z - 320\hat{\sigma}_3^z\hat{\sigma}_{20}^z - 160\hat{\sigma}_4^z\hat{\sigma}_{19}^z - 160\hat{\sigma}_5^z\hat{\sigma}_{18}^z - 320\hat{\sigma}_6^z\hat{\sigma}_{17}^z - 160\hat{\sigma}_7^z\hat{\sigma}_{16}^z - 160\hat{\sigma}_8^z\hat{\sigma}_{15}^z - 320\hat{\sigma}_9^z\hat{\sigma}_{14}^z - \\
& 160\hat{\sigma}_{10}^z\hat{\sigma}_{13}^z - 160\hat{\sigma}_{11}^z\hat{\sigma}_{12}^z - 480\hat{\sigma}_1^z\hat{\sigma}_{23}^z - 320\hat{\sigma}_2^z\hat{\sigma}_{22}^z - 160\hat{\sigma}_3^z\hat{\sigma}_{21}^z - 480\hat{\sigma}_4^z\hat{\sigma}_{20}^z - 320\hat{\sigma}_5^z\hat{\sigma}_{19}^z - 340800\hat{\sigma}_6^z\hat{\sigma}_{18}^z - \\
& 480\hat{\sigma}_7^z\hat{\sigma}_{17}^z - 320\hat{\sigma}_8^z\hat{\sigma}_{16}^z - 160\hat{\sigma}_9^z\hat{\sigma}_{15}^z - 480\hat{\sigma}_{10}^z\hat{\sigma}_{14}^z - 320\hat{\sigma}_{11}^z\hat{\sigma}_{13}^z - 480\hat{\sigma}_2^z\hat{\sigma}_{23}^z - 160\hat{\sigma}_3^z\hat{\sigma}_{22}^z - 320\hat{\sigma}_4^z\hat{\sigma}_{21}^z - 480\hat{\sigma}_5^z\hat{\sigma}_{20}^z - \\
& 340800\hat{\sigma}_6^z\hat{\sigma}_{19}^z - 340800\hat{\sigma}_7^z\hat{\sigma}_{18}^z - 480\hat{\sigma}_8^z\hat{\sigma}_{17}^z - 160\hat{\sigma}_9^z\hat{\sigma}_{16}^z - 320\hat{\sigma}_{10}^z\hat{\sigma}_{15}^z - 480\hat{\sigma}_{11}^z\hat{\sigma}_{14}^z - 320\hat{\sigma}_3^z\hat{\sigma}_{23}^z - 160\hat{\sigma}_4^z\hat{\sigma}_{22}^z - \\
& 160\hat{\sigma}_5^z\hat{\sigma}_{21}^z - 320\hat{\sigma}_9^z\hat{\sigma}_{17}^z - 160\hat{\sigma}_{10}^z\hat{\sigma}_{16}^z - 160\hat{\sigma}_{11}^z\hat{\sigma}_{15}^z - 480\hat{\sigma}_4^z\hat{\sigma}_{23}^z - 320\hat{\sigma}_5^z\hat{\sigma}_{22}^z - 160\hat{\sigma}_6^z\hat{\sigma}_{21}^z - 340800\hat{\sigma}_7^z\hat{\sigma}_{20}^z - \\
& 340800\hat{\sigma}_8^z\hat{\sigma}_{19}^z - 160\hat{\sigma}_9^z\hat{\sigma}_{18}^z - 480\hat{\sigma}_{10}^z\hat{\sigma}_{17}^z - 320\hat{\sigma}_{11}^z\hat{\sigma}_{16}^z + 320\hat{\sigma}_{12}^z\hat{\sigma}_{15}^z - 480\hat{\sigma}_5^z\hat{\sigma}_{23}^z - 160\hat{\sigma}_6^z\hat{\sigma}_{22}^z - 320\hat{\sigma}_7^z\hat{\sigma}_{21}^z - \\
& 340800\hat{\sigma}_8^z\hat{\sigma}_{20}^z - 160\hat{\sigma}_9^z\hat{\sigma}_{19}^z - 320\hat{\sigma}_{10}^z\hat{\sigma}_{18}^z - 480\hat{\sigma}_{11}^z\hat{\sigma}_{17}^z - 320\hat{\sigma}_6^z\hat{\sigma}_{23}^z - 160\hat{\sigma}_7^z\hat{\sigma}_{22}^z - 160\hat{\sigma}_8^z\hat{\sigma}_{21}^z - 320\hat{\sigma}_9^z\hat{\sigma}_{20}^z - \\
& 160\hat{\sigma}_{10}^z\hat{\sigma}_{19}^z - 160\hat{\sigma}_{11}^z\hat{\sigma}_{18}^z + 320\hat{\sigma}_{12}^z\hat{\sigma}_{17}^z + 320\hat{\sigma}_{13}^z\hat{\sigma}_{16}^z + 320\hat{\sigma}_{14}^z\hat{\sigma}_{15}^z - 480\hat{\sigma}_7^z\hat{\sigma}_{23}^z - 320\hat{\sigma}_8^z\hat{\sigma}_{22}^z - 340800\hat{\sigma}_9^z\hat{\sigma}_{21}^z - \\
& 480\hat{\sigma}_{10}^z\hat{\sigma}_{20}^z - 320\hat{\sigma}_{11}^z\hat{\sigma}_{19}^z + 320\hat{\sigma}_{12}^z\hat{\sigma}_{18}^z + 320\hat{\sigma}_{13}^z\hat{\sigma}_{17}^z + 320\hat{\sigma}_{14}^z\hat{\sigma}_{16}^z - 480\hat{\sigma}_8^z\hat{\sigma}_{23}^z - 340800\hat{\sigma}_9^z\hat{\sigma}_{22}^z - 340800\hat{\sigma}_{10}^z\hat{\sigma}_{21}^z - \\
& 480\hat{\sigma}_{11}^z\hat{\sigma}_{20}^z + 640\hat{\sigma}_{14}^z\hat{\sigma}_{17}^z + 320\hat{\sigma}_{12}^z\hat{\sigma}_{20}^z + 320\hat{\sigma}_{13}^z\hat{\sigma}_{19}^z + 320\hat{\sigma}_{14}^z\hat{\sigma}_{18}^z - 340800\hat{\sigma}_{10}^z\hat{\sigma}_{23}^z - 340800\hat{\sigma}_{11}^z\hat{\sigma}_{22}^z + 320\hat{\sigma}_{12}^z\hat{\sigma}_{21}^z + \\
& 320\hat{\sigma}_{13}^z\hat{\sigma}_{20}^z + 320\hat{\sigma}_{14}^z\hat{\sigma}_{19}^z + 320\hat{\sigma}_{15}^z\hat{\sigma}_{18}^z - 340800\hat{\sigma}_{11}^z\hat{\sigma}_{23}^z + 640\hat{\sigma}_{14}^z\hat{\sigma}_{20}^z + 320\hat{\sigma}_{12}^z\hat{\sigma}_{23}^z + 320\hat{\sigma}_{13}^z\hat{\sigma}_{22}^z + 320\hat{\sigma}_{14}^z\hat{\sigma}_{21}^z + \\
& 320\hat{\sigma}_{15}^z\hat{\sigma}_{20}^z + 320\hat{\sigma}_{16}^z\hat{\sigma}_{19}^z + 320\hat{\sigma}_{17}^z\hat{\sigma}_{18}^z + 320\hat{\sigma}_{13}^z\hat{\sigma}_{23}^z + 320\hat{\sigma}_{14}^z\hat{\sigma}_{22}^z + 320\hat{\sigma}_{15}^z\hat{\sigma}_{21}^z + 320\hat{\sigma}_{16}^z\hat{\sigma}_{20}^z + 320\hat{\sigma}_{17}^z\hat{\sigma}_{19}^z +
\end{aligned}$$

$$\begin{aligned}
& 640\hat{\sigma}_{14}^z\hat{\sigma}_{23}^z + 640\hat{\sigma}_{17}^z\hat{\sigma}_{20}^z + 320\hat{\sigma}_{15}^z\hat{\sigma}_{23}^z + 320\hat{\sigma}_{16}^z\hat{\sigma}_{22}^z + 320\hat{\sigma}_{17}^z\hat{\sigma}_{21}^z + 320\hat{\sigma}_{16}^z\hat{\sigma}_{23}^z + 320\hat{\sigma}_{17}^z\hat{\sigma}_{22}^z + 320\hat{\sigma}_{18}^z\hat{\sigma}_{21}^z + \\
& 640\hat{\sigma}_{17}^z\hat{\sigma}_{23}^z + 320\hat{\sigma}_{18}^z\hat{\sigma}_{23}^z + 320\hat{\sigma}_{19}^z\hat{\sigma}_{22}^z + 320\hat{\sigma}_{20}^z\hat{\sigma}_{21}^z + 320\hat{\sigma}_{19}^z\hat{\sigma}_{23}^z + 320\hat{\sigma}_{20}^z\hat{\sigma}_{22}^z + 640\hat{\sigma}_{20}^z\hat{\sigma}_{23}^z + 6142400
\end{aligned}$$

A complete expression of $E_k(s)$ for 28-order Williamson based method or 84-order Baumert-Hall based method

$$\begin{aligned}
 E_k(s) = & 336s_0s_1 + 336s_0s_2 + 336s_0s_3 + 560s_1s_2 + 560s_1s_3 + 560s_2s_3 + 336s_4s_5 + 336s_4s_6 + 336s_4s_7 + \\
 & 560s_5s_6 + 560s_5s_7 + 560s_6s_7 + 336s_8s_9 + 336s_8s_{10} + 336s_8s_{11} + 560s_9s_{10} + 560s_9s_{11} + 560s_{10}s_{11} + 336s_{12}s_{13} + \\
 & 336s_{12}s_{14} + 336s_{12}s_{15} + 560s_{13}s_{14} + 560s_{13}s_{15} + 560s_{14}s_{15} + 336s_0s_1s_2s_3 + 112s_0s_1s_4s_5 + 112s_0s_1s_5s_6 + \\
 & 112s_0s_2s_4s_5 + 112s_1s_2s_4s_5 + 112s_0s_1s_6s_7 + 112s_0s_2s_5s_7 + 112s_0s_3s_4s_7 + 112s_0s_3s_5s_6 + 112s_1s_2s_4s_7 + 224s_1s_2s_5s_6 + \\
 & 112s_1s_3s_4s_6 + 112s_2s_3s_4s_5 + 112s_0s_2s_6s_7 + 112s_0s_3s_5s_7 + 112s_1s_2s_5s_7 + 112s_1s_3s_4s_7 + 112s_1s_3s_5s_6 + 112s_2s_3s_4s_6 + \\
 & 112s_1s_2s_6s_7 + 224s_1s_3s_5s_7 + 112s_2s_3s_5s_6 + 112s_1s_3s_6s_7 + 112s_2s_3s_5s_7 + 112s_0s_1s_8s_9 + 224s_2s_3s_6s_7 + 112s_0s_1s_9s_{10} + \\
 & 112s_0s_2s_8s_{10} + 112s_1s_2s_8s_9 + 112s_0s_1s_{10}s_{11} + 112s_0s_2s_9s_{11} + 112s_0s_3s_8s_{11} + 112s_0s_3s_9s_{10} + 112s_1s_2s_8s_{11} + \\
 & 224s_1s_2s_9s_{10} + 112s_1s_3s_8s_{10} + 112s_2s_3s_8s_9 + 336s_4s_5s_6s_7 + 112s_0s_2s_{10}s_{11} + 112s_0s_3s_9s_{11} + 112s_1s_2s_9s_{11} + \\
 & 112s_1s_3s_8s_{11} + 112s_1s_3s_9s_{10} + 112s_2s_3s_8s_{10} + 112s_1s_2s_{10}s_{11} + 224s_1s_3s_9s_{11} + 112s_2s_3s_9s_{10} + 112s_1s_3s_{10}s_{11} + \\
 & 112s_2s_3s_9s_{11} + 112s_0s_1s_{12}s_{13} + 224s_2s_3s_{10}s_{11} + 112s_4s_5s_8s_9 + 112s_0s_1s_{13}s_{14} + 112s_0s_2s_{12}s_{14} + 112s_1s_2s_{12}s_{13} + \\
 & 112s_4s_5s_9s_{10} + 112s_4s_6s_8s_{10} + 112s_5s_6s_8s_9 + 112s_0s_1s_{14}s_{15} + 112s_0s_2s_{13}s_{15} + 112s_0s_3s_{12}s_{15} + 112s_0s_3s_{13}s_{14} + \\
 & 112s_1s_2s_{12}s_{15} + 224s_1s_2s_{13}s_{14} + 112s_1s_3s_{12}s_{14} + 112s_2s_3s_{12}s_{13} + 112s_4s_5s_{10}s_{11} + 112s_4s_6s_9s_{11} + 112s_4s_7s_8s_{11} + \\
 & 112s_4s_7s_9s_{10} + 112s_5s_6s_8s_{11} + 224s_5s_6s_9s_{10} + 112s_5s_7s_8s_{10} + 112s_6s_7s_8s_9 + 112s_0s_2s_{14}s_{15} + 112s_0s_3s_{13}s_{15} + \\
 & 112s_1s_2s_{13}s_{15} + 112s_1s_3s_{12}s_{15} + 112s_1s_3s_{13}s_{14} + 112s_2s_3s_{12}s_{14} + 112s_4s_6s_{10}s_{11} + 112s_4s_7s_9s_{11} + 112s_5s_6s_9s_{11} + \\
 & 112s_5s_7s_8s_{11} + 112s_5s_7s_9s_{10} + 112s_6s_7s_8s_{10} + 112s_1s_2s_{14}s_{15} + 224s_1s_3s_{13}s_{15} + 112s_2s_3s_{13}s_{14} + 112s_5s_6s_{10}s_{11} + \\
 & 224s_5s_7s_9s_{11} + 112s_6s_7s_9s_{10} + 112s_1s_3s_{14}s_{15} + 112s_2s_3s_{13}s_{15} + 112s_5s_7s_{10}s_{11} + 112s_6s_7s_9s_{11} + 224s_2s_3s_{14}s_{15} + \\
 & 112s_4s_5s_{12}s_{13} + 224s_6s_7s_{10}s_{11} + 112s_4s_5s_{13}s_{14} + 112s_4s_6s_{12}s_{14} + 112s_5s_6s_{12}s_{13} + 112s_4s_5s_{14}s_{15} + 112s_4s_6s_{13}s_{15} + \\
 & 112s_4s_7s_{12}s_{15} + 112s_4s_7s_{13}s_{14} + 112s_5s_6s_{12}s_{15} + 224s_5s_6s_{13}s_{14} + 112s_5s_7s_{12}s_{14} + 112s_6s_7s_{12}s_{13} + 336s_8s_9s_{10}s_{11} + \\
 & 112s_4s_6s_{14}s_{15} + 112s_4s_7s_{13}s_{15} + 112s_5s_6s_{13}s_{15} + 112s_5s_7s_{12}s_{15} + 112s_5s_7s_{13}s_{14} + 112s_6s_7s_{12}s_{14} + 112s_5s_6s_{14}s_{15} + \\
 & 224s_5s_7s_{13}s_{15} + 112s_6s_7s_{13}s_{14} + 112s_5s_7s_{14}s_{15} + 112s_6s_7s_{13}s_{15} + 224s_6s_7s_{14}s_{15} + 112s_8s_9s_{12}s_{13} + 112s_8s_9s_{13}s_{14} + \\
 & 112s_8s_{10}s_{12}s_{14} + 112s_9s_{10}s_{12}s_{13} + 112s_8s_9s_{14}s_{15} + 112s_8s_{10}s_{13}s_{15} + 112s_8s_{11}s_{12}s_{15} + 112s_8s_{11}s_{13}s_{14} + 112s_9s_{10}s_{12}s_{15} + \\
 & 224s_9s_{10}s_{13}s_{14} + 112s_9s_{11}s_{12}s_{14} + 112s_{10}s_{11}s_{12}s_{13} + 112s_8s_{10}s_{14}s_{15} + 112s_8s_{11}s_{13}s_{15} + 112s_9s_{10}s_{13}s_{15} + \\
 & 112s_9s_{11}s_{12}s_{15} + 112s_9s_{11}s_{13}s_{14} + 112s_{10}s_{11}s_{12}s_{14} + 112s_9s_{10}s_{14}s_{15} + 224s_9s_{11}s_{13}s_{15} + 112s_{10}s_{11}s_{13}s_{14} + \\
 & 112s_9s_{11}s_{14}s_{15} + 112s_{10}s_{11}s_{13}s_{15} + 224s_{10}s_{11}s_{14}s_{15} + 336s_{12}s_{13}s_{14}s_{15} + 2688
 \end{aligned}$$

A complete expression of $E_k(q)$ for 28-order Williamson based method or 84-order Baumert-Hall based method

$$\begin{aligned}
 E_k(q) = & 6720q_0q_1 - 13664q_1 - 13664q_2 - 13664q_3 - 8736q_4 - 13664q_5 - 13664q_6 - 13664q_7 - \\
 & 8736q_8 - 13664q_9 - 13664q_{10} - 13664q_{11} - 8736q_{12} - 13664q_{13} - 13664q_{14} - 13664q_{15} - 8736q_0 + \\
 & 6720q_0q_2 + 6720q_0q_3 + 11648q_1q_2 + 1344q_0q_4 + 11648q_1q_3 + 2240q_0q_5 + 2240q_1q_4 + 11648q_2q_3 + \\
 & 2240q_0q_6 + 4032q_1q_5 + 2240q_2q_4 + 2240q_0q_7 + 3584q_1q_6 + 3584q_2q_5 + 2240q_3q_4 + 1344q_0q_8 + 3584q_1q_7 + \\
 & 4032q_2q_6 + 3584q_3q_5 + 2240q_0q_9 + 2240q_1q_8 + 3584q_2q_7 + 3584q_3q_6 + 6720q_4q_5 + 2240q_0q_{10} + 4032q_1q_9 + \\
 & 2240q_2q_8 + 4032q_3q_7 + 6720q_4q_6 + 2240q_0q_{11} + 3584q_1q_{10} + 3584q_2q_9 + 2240q_3q_8 + 6720q_4q_7 + 11648q_5q_6 + \\
 & 1344q_0q_{12} + 3584q_1q_{11} + 4032q_2q_{10} + 3584q_3q_9 + 1344q_4q_8 + 11648q_5q_7 + 2240q_0q_{13} + 2240q_1q_{12} + \\
 & 3584q_2q_{11} + 3584q_3q_{10} + 2240q_4q_9 + 2240q_5q_8 + 11648q_6q_7 + 2240q_0q_{14} + 4032q_1q_{13} + 2240q_2q_{12} + \\
 & 4032q_3q_{11} + 2240q_4q_{10} + 4032q_5q_9 + 2240q_6q_8 + 2240q_0q_{15} + 3584q_1q_{14} + 3584q_2q_{13} + 2240q_3q_{12} + \\
 & 2240q_4q_{11} + 3584q_5q_{10} + 3584q_6q_9 + 2240q_7q_8 + 3584q_1q_{15} + 4032q_2q_{14} + 3584q_3q_{13} + 1344q_4q_{12} + \\
 & 3584q_5q_{11} + 4032q_6q_{10} + 3584q_7q_9 + 3584q_2q_{15} + 3584q_3q_{14} + 2240q_4q_{13} + 2240q_5q_{12} + 3584q_6q_{11} + \\
 & 3584q_7q_{10} + 6720q_8q_9 + 4032q_3q_{15} + 2240q_4q_{14} + 4032q_5q_{13} + 2240q_6q_{12} + 4032q_7q_{11} + 6720q_8q_{10} + \\
 & 2240q_4q_{15} + 3584q_5q_{14} + 3584q_6q_{13} + 2240q_7q_{12} + 6720q_8q_{11} + 11648q_9q_{10} + 3584q_5q_{15} + 4032q_6q_{14} + \\
 & 3584q_7q_{13} + 1344q_8q_{12} + 11648q_9q_{11} + 3584q_6q_{15} + 3584q_7q_{14} + 2240q_8q_{13} + 2240q_9q_{12} + 11648q_{10}q_{11} + \\
 & 4032q_7q_{15} + 2240q_8q_{14} + 4032q_9q_{13} + 2240q_{10}q_{12} + 2240q_8q_{15} + 3584q_9q_{14} + 3584q_{10}q_{13} + 2240q_{11}q_{12} + \\
 & 3584q_9q_{15} + 4032q_{10}q_{14} + 3584q_{11}q_{13} + 3584q_{10}q_{15} + 3584q_{11}q_{14} + 6720q_{12}q_{13} + 4032q_{11}q_{15} + 6720q_{12}q_{14} + \\
 & 6720q_{12}q_{15} + 11648q_{13}q_{14} + 11648q_{13}q_{15} + 11648q_{14}q_{15} - 2688q_0q_1q_2 - 2688q_0q_1q_3 - 896q_0q_1q_4 - \\
 & 2688q_0q_2q_3 - 1792q_0q_1q_5 - 896q_0q_2q_4 - 2688q_1q_2q_3 - 1792q_0q_1q_6 - 896q_0q_2q_5 - 896q_0q_3q_4 - 1792q_1q_2q_4 -
 \end{aligned}$$

$$\begin{aligned}
& 896q_0q_1q_7 - 1792q_0q_2q_6 - 1792q_0q_3q_5 - 3584q_1q_2q_5 - 1792q_1q_3q_4 - 896q_0q_1q_8 - 1792q_0q_2q_7 - 896q_0q_3q_6 - \\
& 896q_0q_4q_5 - 2688q_1q_2q_6 - 2688q_1q_3q_5 - 1792q_2q_3q_4 - 1792q_0q_1q_9 - 896q_0q_2q_8 - 1792q_0q_3q_7 - 896q_0q_4q_6 - \\
& 2688q_1q_2q_7 - 2688q_1q_3q_6 - 1792q_1q_4q_5 - 2688q_2q_3q_5 - 1792q_0q_1q_{10} - 896q_0q_2q_9 - 896q_0q_3q_8 - 896q_0q_4q_7 - \\
& 1792q_0q_5q_6 - 1792q_1q_2q_8 - 3584q_1q_3q_7 - 896q_1q_4q_6 - 3584q_2q_3q_6 - 1792q_2q_4q_5 - 896q_0q_1q_{11} - \\
& 1792q_0q_2q_{10} - 1792q_0q_3q_9 - 1792q_0q_5q_7 - 3584q_1q_2q_9 - 1792q_1q_3q_8 - 1792q_1q_4q_7 - 3584q_1q_5q_6 - \\
& 2688q_2q_3q_7 - 1792q_2q_4q_6 - 896q_3q_4q_5 - 896q_0q_1q_{12} - 1792q_0q_2q_{11} - 896q_0q_3q_{10} - 1792q_0q_6q_7 - \\
& 2688q_1q_2q_{10} - 2688q_1q_3q_9 - 2688q_1q_5q_7 - 1792q_2q_3q_8 - 896q_2q_4q_7 - 2688q_2q_5q_6 - 1792q_3q_4q_6 - \\
& 1792q_0q_1q_{13} - 896q_0q_2q_{12} - 1792q_0q_3q_{11} - 2688q_1q_2q_{11} - 2688q_1q_3q_{10} - 2688q_1q_6q_7 - 2688q_2q_3q_9 - \\
& 2688q_2q_5q_7 - 1792q_3q_4q_7 - 2688q_3q_5q_6 - 1792q_0q_1q_{14} - 896q_0q_2q_{13} - 896q_0q_3q_{12} - 1792q_1q_2q_{12} - \\
& 3584q_1q_3q_{11} - 3584q_2q_3q_{10} - 3584q_2q_6q_7 - 3584q_3q_5q_7 - 2688q_4q_5q_6 - 896q_0q_1q_{15} - 1792q_0q_2q_{14} - \\
& 1792q_0q_3q_{13} - 3584q_1q_2q_{13} - 1792q_1q_3q_{12} - 2688q_2q_3q_{11} - 2688q_3q_6q_7 - 2688q_4q_5q_7 - 1792q_0q_2q_{15} - \\
& 896q_0q_3q_{14} - 896q_0q_8q_9 - 2688q_1q_2q_{14} - 2688q_1q_3q_{13} - 1792q_2q_3q_{12} - 896q_4q_5q_8 - 2688q_4q_6q_7 - \\
& 1792q_0q_3q_{15} - 896q_0q_8q_{10} - 2688q_1q_2q_{15} - 2688q_1q_3q_{14} - 1792q_1q_8q_9 - 2688q_2q_3q_{13} - 1792q_4q_5q_9 - \\
& 896q_4q_6q_8 - 2688q_5q_6q_7 - 896q_0q_8q_{11} - 1792q_0q_9q_{10} - 3584q_1q_3q_{15} - 896q_1q_8q_{10} - 3584q_2q_3q_{14} - \\
& 1792q_2q_8q_9 - 1792q_4q_5q_{10} - 896q_4q_6q_9 - 896q_4q_7q_8 - 1792q_5q_6q_8 - 1792q_0q_9q_{11} - 1792q_1q_8q_{11} - \\
& 3584q_1q_9q_{10} - 2688q_2q_3q_{15} - 1792q_2q_8q_{10} - 896q_3q_8q_9 - 896q_4q_5q_{11} - 1792q_4q_6q_{10} - 1792q_4q_7q_9 - \\
& 3584q_5q_6q_9 - 1792q_5q_7q_8 - 1792q_0q_{10}q_{11} - 2688q_1q_9q_{11} - 896q_2q_8q_{11} - 2688q_2q_9q_{10} - 1792q_3q_8q_{10} - \\
& 896q_4q_5q_{12} - 1792q_4q_6q_{11} - 896q_4q_7q_{10} - 896q_4q_8q_9 - 2688q_5q_6q_{10} - 2688q_5q_7q_9 - 1792q_6q_7q_8 - \\
& 2688q_1q_{10}q_{11} - 2688q_2q_9q_{11} - 1792q_3q_8q_{11} - 2688q_3q_9q_{10} - 1792q_4q_5q_{13} - 896q_4q_6q_{12} - 1792q_4q_7q_{11} - \\
& 896q_4q_8q_{10} - 2688q_5q_6q_{11} - 2688q_5q_7q_{10} - 1792q_5q_8q_9 - 2688q_6q_7q_9 - 3584q_2q_{10}q_{11} - 3584q_3q_9q_{11} - \\
& 1792q_4q_5q_{14} - 896q_4q_6q_{13} - 896q_4q_7q_{12} - 896q_4q_8q_{11} - 1792q_4q_9q_{10} - 1792q_5q_6q_{12} - 3584q_5q_7q_{11} - \\
& 896q_5q_8q_{10} - 3584q_6q_7q_{10} - 1792q_6q_8q_9 - 2688q_3q_{10}q_{11} - 896q_4q_5q_{15} - 1792q_4q_6q_{14} - 1792q_4q_7q_{13} - \\
& 1792q_4q_9q_{11} - 3584q_5q_6q_{13} - 1792q_5q_7q_{12} - 1792q_5q_8q_{11} - 3584q_5q_9q_{10} - 2688q_6q_7q_{11} - 1792q_6q_8q_{10} - \\
& 896q_7q_8q_9 - 896q_0q_{12}q_{13} - 1792q_4q_6q_{15} - 896q_4q_7q_{14} - 1792q_4q_{10}q_{11} - 2688q_5q_6q_{14} - 2688q_5q_7q_{13} - \\
& 2688q_5q_9q_{11} - 1792q_6q_7q_{12} - 896q_6q_8q_{11} - 2688q_6q_9q_{10} - 1792q_7q_8q_{10} - 896q_0q_{12}q_{14} - 1792q_1q_{12}q_{13} - \\
& 1792q_4q_7q_{15} - 2688q_5q_6q_{15} - 2688q_5q_7q_{14} - 2688q_5q_{10}q_{11} - 2688q_6q_7q_{13} - 2688q_6q_9q_{11} - 1792q_7q_8q_{11} - \\
& 2688q_7q_9q_{10} - 896q_0q_{12}q_{15} - 1792q_0q_{13}q_{14} - 896q_1q_{12}q_{14} - 1792q_2q_{12}q_{13} - 3584q_5q_7q_{15} - 3584q_6q_7q_{14} - \\
& 3584q_6q_{10}q_{11} - 3584q_7q_9q_{11} - 2688q_8q_9q_{10} - 1792q_0q_{13}q_{15} - 1792q_1q_{12}q_{15} - 3584q_1q_{13}q_{14} - 1792q_2q_{12}q_{14} - \\
& 896q_3q_{12}q_{13} - 2688q_6q_7q_{15} - 2688q_7q_{10}q_{11} - 2688q_8q_9q_{11} - 1792q_0q_{14}q_{15} - 2688q_1q_{13}q_{15} - 896q_2q_{12}q_{15} - \\
& 2688q_2q_{13}q_{14} - 1792q_3q_{12}q_{14} - 896q_4q_{12}q_{13} - 896q_8q_9q_{12} - 2688q_8q_{10}q_{11} - 2688q_1q_{14}q_{15} - 2688q_2q_{13}q_{15} - \\
& 1792q_3q_{12}q_{15} - 2688q_3q_{13}q_{14} - 896q_4q_{12}q_{14} - 1792q_5q_{12}q_{13} - 1792q_8q_9q_{13} - 896q_8q_{10}q_{12} - 2688q_9q_{10}q_{11} - \\
& 3584q_2q_{14}q_{15} - 3584q_3q_{13}q_{15} - 896q_4q_{12}q_{15} - 1792q_4q_{13}q_{14} - 896q_5q_{12}q_{14} - 1792q_6q_{12}q_{13} - 1792q_8q_9q_{14} - \\
& 896q_8q_{10}q_{13} - 896q_8q_{11}q_{12} - 1792q_9q_{10}q_{12} - 2688q_3q_{14}q_{15} - 1792q_4q_{13}q_{15} - 1792q_5q_{12}q_{15} - 3584q_5q_{13}q_{14} - \\
& 1792q_6q_{12}q_{14} - 896q_7q_{12}q_{13} - 896q_8q_9q_{15} - 1792q_8q_{10}q_{14} - 1792q_8q_{11}q_{13} - 3584q_9q_{10}q_{13} - 1792q_9q_{11}q_{12} - \\
& 1792q_4q_{14}q_{15} - 2688q_5q_{13}q_{15} - 896q_6q_{12}q_{15} - 2688q_6q_{13}q_{14} - 1792q_7q_{12}q_{14} - 1792q_8q_{10}q_{15} - 896q_8q_{11}q_{14} - \\
& 896q_8q_{12}q_{13} - 2688q_9q_{10}q_{14} - 2688q_9q_{11}q_{13} - 1792q_{10}q_{11}q_{12} - 2688q_5q_{14}q_{15} - 2688q_6q_{13}q_{15} - 1792q_7q_{12}q_{15} - \\
& 2688q_7q_{13}q_{14} - 1792q_8q_{11}q_{15} - 896q_8q_{12}q_{14} - 2688q_9q_{10}q_{15} - 2688q_9q_{11}q_{14} - 1792q_9q_{12}q_{13} - 2688q_{10}q_{11}q_{13} - \\
& 3584q_6q_{14}q_{15} - 3584q_7q_{13}q_{15} - 896q_8q_{12}q_{15} - 1792q_8q_{13}q_{14} - 3584q_9q_{11}q_{15} - 896q_9q_{12}q_{14} - 3584q_{10}q_{11}q_{14} - \\
& 1792q_{10}q_{12}q_{13} - 2688q_7q_{14}q_{15} - 1792q_8q_{13}q_{15} - 1792q_9q_{12}q_{15} - 3584q_9q_{13}q_{14} - 2688q_{10}q_{11}q_{15} - \\
& 1792q_{10}q_{12}q_{14} - 896q_{11}q_{12}q_{13} - 1792q_8q_{14}q_{15} - 2688q_9q_{13}q_{15} - 896q_{10}q_{12}q_{15} - 2688q_{10}q_{13}q_{14} - 1792q_{11}q_{12}q_{14} - \\
& 2688q_9q_{14}q_{15} - 2688q_{10}q_{13}q_{15} - 1792q_{11}q_{12}q_{15} - 2688q_{11}q_{13}q_{14} - 3584q_{10}q_{14}q_{15} - 3584q_{11}q_{13}q_{15} - \\
& 2688q_{12}q_{13}q_{14} - 2688q_{11}q_{14}q_{15} - 2688q_{12}q_{13}q_{15} - 2688q_{12}q_{14}q_{15} - 2688q_{13}q_{14}q_{15} + 5376q_0q_1q_2q_3 + \\
& 1792q_0q_1q_4q_5 + 1792q_0q_1q_5q_6 + 1792q_0q_2q_4q_6 + 1792q_1q_2q_4q_5 + 1792q_0q_1q_6q_7 + 1792q_0q_2q_5q_7 + \\
& 1792q_0q_3q_4q_7 + 1792q_0q_3q_5q_6 + 1792q_1q_2q_4q_7 + 3584q_1q_2q_5q_6 + 1792q_1q_3q_4q_6 + 1792q_2q_3q_4q_5 + \\
& 1792q_0q_2q_6q_7 + 1792q_0q_3q_5q_7 + 1792q_1q_2q_5q_7 + 1792q_1q_3q_4q_7 + 1792q_1q_3q_5q_6 + 1792q_2q_3q_4q_6 + \\
& 1792q_1q_2q_6q_7 + 3584q_1q_3q_5q_7 + 1792q_2q_3q_5q_6 + 1792q_1q_3q_6q_7 + 1792q_2q_3q_5q_7 + 1792q_0q_1q_8q_9 + \\
& 3584q_2q_3q_6q_7 + 1792q_0q_1q_9q_{10} + 1792q_0q_2q_8q_{10} + 1792q_1q_2q_8q_9 + 1792q_0q_1q_{10}q_{11} + 1792q_0q_2q_9q_{11} + \\
& 1792q_0q_3q_8q_{11} + 1792q_0q_3q_9q_{10} + 1792q_1q_2q_8q_{11} + 3584q_1q_2q_9q_{10} + 1792q_1q_3q_8q_{10} + 1792q_2q_3q_8q_9 +
\end{aligned}$$

$$\begin{aligned}
& 5376q_4q_5q_6q_7 + 1792q_0q_2q_{10}q_{11} + 1792q_0q_3q_9q_{11} + 1792q_1q_2q_9q_{11} + 1792q_1q_3q_8q_{11} + 1792q_1q_3q_9q_{10} + \\
& 1792q_2q_3q_8q_{10} + 1792q_1q_2q_{10}q_{11} + 3584q_1q_3q_9q_{11} + 1792q_2q_3q_9q_{10} + 1792q_1q_3q_{10}q_{11} + 1792q_2q_3q_9q_{11} + \\
& 1792q_0q_1q_{12}q_{13} + 3584q_2q_3q_{10}q_{11} + 1792q_4q_5q_8q_9 + 1792q_0q_1q_{13}q_{14} + 1792q_0q_2q_{12}q_{14} + 1792q_1q_2q_{12}q_{13} + \\
& 1792q_4q_5q_9q_{10} + 1792q_4q_6q_8q_{10} + 1792q_5q_6q_8q_9 + 1792q_0q_1q_{14}q_{15} + 1792q_0q_2q_{13}q_{15} + 1792q_0q_3q_{12}q_{15} + \\
& 1792q_0q_3q_{13}q_{14} + 1792q_1q_2q_{12}q_{15} + 3584q_1q_2q_{13}q_{14} + 1792q_1q_3q_{12}q_{14} + 1792q_2q_3q_{12}q_{13} + 1792q_4q_5q_{10}q_{11} + \\
& 1792q_4q_6q_9q_{11} + 1792q_4q_7q_8q_{11} + 1792q_4q_7q_9q_{10} + 1792q_5q_6q_8q_{11} + 3584q_5q_6q_9q_{10} + 1792q_5q_7q_8q_{10} + \\
& 1792q_6q_7q_8q_9 + 1792q_0q_2q_{14}q_{15} + 1792q_0q_3q_{13}q_{15} + 1792q_1q_2q_{13}q_{15} + 1792q_1q_3q_{12}q_{15} + 1792q_1q_3q_{13}q_{14} + \\
& 1792q_2q_3q_{12}q_{14} + 1792q_4q_6q_{10}q_{11} + 1792q_4q_7q_9q_{11} + 1792q_5q_6q_9q_{11} + 1792q_5q_7q_8q_{11} + 1792q_5q_7q_9q_{10} + \\
& 1792q_6q_7q_8q_{10} + 1792q_1q_2q_{14}q_{15} + 3584q_1q_3q_{13}q_{15} + 1792q_2q_3q_{13}q_{14} + 1792q_5q_6q_{10}q_{11} + 3584q_5q_7q_9q_{11} + \\
& 1792q_6q_7q_9q_{10} + 1792q_1q_3q_{14}q_{15} + 1792q_2q_3q_{13}q_{15} + 1792q_5q_7q_{10}q_{11} + 1792q_6q_7q_9q_{11} + 3584q_2q_3q_{14}q_{15} + \\
& 1792q_4q_5q_{12}q_{13} + 3584q_6q_7q_{10}q_{11} + 1792q_4q_5q_{13}q_{14} + 1792q_4q_6q_{12}q_{14} + 1792q_5q_6q_{12}q_{13} + 1792q_4q_5q_{14}q_{15} + \\
& 1792q_4q_6q_{13}q_{15} + 1792q_4q_7q_{12}q_{15} + 1792q_4q_7q_{13}q_{14} + 1792q_5q_6q_{12}q_{15} + 3584q_5q_6q_{13}q_{14} + 1792q_5q_7q_{12}q_{14} + \\
& 1792q_6q_7q_{12}q_{13} + 5376q_8q_9q_{10}q_{11} + 1792q_4q_6q_{14}q_{15} + 1792q_4q_7q_{13}q_{15} + 1792q_5q_6q_{13}q_{15} + 1792q_5q_7q_{12}q_{15} + \\
& 1792q_5q_7q_{13}q_{14} + 1792q_6q_7q_{12}q_{14} + 1792q_5q_6q_{14}q_{15} + 3584q_5q_7q_{13}q_{15} + 1792q_6q_7q_{13}q_{14} + 1792q_5q_7q_{14}q_{15} + \\
& 1792q_6q_7q_{13}q_{15} + 3584q_6q_7q_{14}q_{15} + 1792q_8q_9q_{12}q_{13} + 1792q_8q_9q_{13}q_{14} + 1792q_8q_{10}q_{12}q_{14} + 1792q_9q_{10}q_{12}q_{13} + \\
& 1792q_8q_9q_{14}q_{15} + 1792q_8q_{10}q_{13}q_{15} + 1792q_8q_{11}q_{12}q_{15} + 1792q_8q_{11}q_{13}q_{14} + 1792q_9q_{10}q_{12}q_{15} + 3584q_9q_{10}q_{13}q_{14} + \\
& 1792q_9q_{11}q_{12}q_{14} + 1792q_{10}q_{11}q_{12}q_{13} + 1792q_8q_{10}q_{14}q_{15} + 1792q_8q_{11}q_{13}q_{15} + 1792q_9q_{10}q_{13}q_{15} + 1792q_9q_{11}q_{12}q_{15} + \\
& 1792q_9q_{11}q_{13}q_{14} + 1792q_{10}q_{11}q_{12}q_{14} + 1792q_9q_{10}q_{14}q_{15} + 3584q_9q_{11}q_{13}q_{15} + 1792q_{10}q_{11}q_{13}q_{14} + 1792q_9q_{11}q_{14}q_{15} + \\
& 1792q_{10}q_{11}q_{13}q_{15} + 3584q_{10}q_{11}q_{14}q_{15} + 5376q_{12}q_{13}q_{14}q_{15} + 32928
\end{aligned}$$

A complete expression of $E_2(q)$ for 28-order Williamson based method or 84-order Baumert-Hall based method by taking $\delta = 3, 355, 968$

$$\begin{aligned}
E_2(q) = & 10074624q_{16} - 13664q_1 - 13664q_2 - 13664q_3 - 8736q_4 - 13664q_5 - 13664q_6 - 13664q_7 - \\
& 8736q_8 - 13664q_9 - 13664q_{10} - 13664q_{11} - 8736q_{12} - 13664q_{13} - 13664q_{14} - 13664q_{15} - 8736q_0 + \\
& 10074624q_{17} + 10074624q_{18} + 10079552q_{19} + 10079552q_{20} + 10079552q_{21} + 10074624q_{22} + 10074624q_{23} + \\
& 10074624q_{24} + 10079552q_{25} + 10079552q_{26} + 10079552q_{27} + 10074624q_{28} + 10074624q_{29} + 10074624q_{30} + \\
& 10079552q_{31} + 10079552q_{32} + 10079552q_{33} + 10074624q_{34} + 10074624q_{35} + 10074624q_{36} + 10079552q_{37} + \\
& 10079552q_{38} + 10079552q_{39} + 3355968q_0q_1 + 3355968q_0q_2 + 3355968q_0q_3 + 3355968q_1q_2 + 1344q_0q_4 + \\
& 3355968q_1q_3 + 2240q_0q_5 + 2240q_1q_4 + 3355968q_2q_3 + 2240q_0q_6 + 4032q_1q_5 + 2240q_2q_4 + 2240q_0q_7 + \\
& 3584q_1q_6 + 3584q_2q_5 + 2240q_3q_4 + 1344q_0q_8 + 3584q_1q_7 + 4032q_2q_6 + 3584q_3q_5 + 2240q_0q_9 + 2240q_1q_8 + \\
& 3584q_2q_7 + 3584q_3q_6 + 3355968q_4q_5 + 2240q_0q_{10} + 4032q_1q_9 + 2240q_2q_8 + 4032q_3q_7 + 3355968q_4q_6 + \\
& 2240q_0q_{11} + 3584q_1q_{10} + 3584q_2q_9 + 2240q_3q_8 + 3355968q_4q_7 + 3355968q_5q_6 + 1344q_0q_{12} + 3584q_1q_{11} + \\
& 4032q_2q_{10} + 3584q_3q_9 + 1344q_4q_8 + 3355968q_5q_7 + 2240q_0q_{13} + 2240q_1q_{12} + 3584q_2q_{11} + 3584q_3q_{10} + \\
& 2240q_4q_9 + 2240q_5q_8 + 3355968q_6q_7 + 2240q_0q_{14} + 4032q_1q_{13} + 2240q_2q_{12} + 4032q_3q_{11} + 2240q_4q_{10} + \\
& 4032q_5q_9 + 2240q_6q_8 + 2240q_0q_{15} + 3584q_1q_{14} + 3584q_2q_{13} + 2240q_3q_{12} + 2240q_4q_{11} + 3584q_5q_{10} + \\
& 3584q_6q_9 + 2240q_7q_8 - 6711936q_0q_{16} + 3584q_1q_{15} + 4032q_2q_{14} + 3584q_3q_{13} + 1344q_4q_{12} + 3584q_5q_{11} + \\
& 4032q_6q_{10} + 3584q_7q_9 - 6711936q_0q_{17} - 6711936q_1q_{16} + 3584q_2q_{15} + 3584q_3q_{14} + 2240q_4q_{13} + 2240q_5q_{12} + \\
& 3584q_6q_{11} + 3584q_7q_{10} + 3355968q_8q_9 - 6711936q_0q_{18} - 2688q_2q_{16} + 4032q_3q_{15} + 2240q_4q_{14} + 4032q_5q_{13} + \\
& 2240q_6q_{12} + 4032q_7q_{11} + 3355968q_8q_{10} - 6711936q_2q_{17} - 2688q_3q_{16} + 2240q_4q_{15} + 3584q_5q_{14} + 3584q_6q_{13} + \\
& 2240q_7q_{12} + 3355968q_8q_{11} + 3355968q_9q_{10} - 6711936q_1q_{19} - 2688q_3q_{17} - 896q_4q_{16} + 3584q_5q_{15} + \\
& 4032q_6q_{14} + 3584q_7q_{13} + 1344q_8q_{12} + 3355968q_9q_{11} - 6711936q_1q_{20} - 6711936q_2q_{19} - 6711936q_3q_{18} - \\
& 896q_4q_{17} - 1792q_5q_{16} + 3584q_6q_{15} + 3584q_7q_{14} + 2240q_8q_{13} + 2240q_9q_{12} + 3355968q_{10}q_{11} - 896q_0q_{22} - \\
& 2688q_3q_{19} - 896q_4q_{18} - 896q_5q_{17} - 1792q_6q_{16} + 4032q_7q_{15} + 2240q_8q_{14} + 4032q_9q_{13} + 2240q_{10}q_{12} - \\
& 896q_0q_{23} - 1792q_1q_{22} - 6711936q_2q_{21} - 6711936q_3q_{20} - 1792q_4q_{19} - 1792q_5q_{18} - 1792q_6q_{17} - 896q_7q_{16} + \\
& 2240q_8q_{15} + 3584q_9q_{14} + 3584q_{10}q_{13} + 2240q_{11}q_{12} - 896q_0q_{24} - 896q_1q_{23} - 1792q_2q_{22} - 6711936q_3q_{21} - \\
& 1792q_4q_{20} - 3584q_5q_{19} - 896q_6q_{18} - 1792q_7q_{17} - 896q_8q_{16} + 3584q_9q_{15} + 4032q_{10}q_{14} + 3584q_{11}q_{13} - \\
& 1792q_0q_{25} - 1792q_1q_{24} - 1792q_2q_{23} - 896q_3q_{22} - 1792q_4q_{21} - 2688q_5q_{20} - 2688q_6q_{19} - 1792q_7q_{18} - \\
& 896q_8q_{17} - 1792q_9q_{16} + 3584q_{10}q_{15} + 3584q_{11}q_{14} + 3355968q_{12}q_{13} - 1792q_0q_{26} - 3584q_1q_{25} - 896q_2q_{24} -
\end{aligned}$$

$$\begin{aligned}
& 1792q_3q_{23} - 6711936q_4q_{22} - 2688q_5q_{21} - 2688q_6q_{20} - 2688q_7q_{19} - 896q_8q_{18} - 896q_9q_{17} - 1792q_{10}q_{16} + \\
& 4032q_{11}q_{15} + 3355968q_{12}q_{14} - 1792q_0q_{27} - 2688q_1q_{26} - 2688q_2q_{25} - 1792q_3q_{24} - 6711936q_4q_{23} - \\
& 6711936q_5q_{22} - 3584q_6q_{21} - 3584q_7q_{20} - 1792q_8q_{19} - 1792q_9q_{18} - 1792q_{10}q_{17} - 896q_{11}q_{16} + 3355968q_{12}q_{15} + \\
& 3355968q_{13}q_{14} - 896q_0q_{28} - 2688q_1q_{27} - 2688q_2q_{26} - 2688q_3q_{25} - 6711936q_4q_{24} - 2688q_6q_{22} - 2688q_7q_{21} - \\
& 1792q_8q_{20} - 3584q_9q_{19} - 896q_{10}q_{18} - 1792q_{11}q_{17} - 896q_{12}q_{16} + 3355968q_{13}q_{15} - 896q_0q_{29} - 1792q_1q_{28} - \\
& 3584q_2q_{27} - 3584q_3q_{26} - 6711936q_6q_{23} - 2688q_7q_{22} - 1792q_8q_{21} - 2688q_9q_{20} - 2688q_{10}q_{19} - 1792q_{11}q_{18} - \\
& 896q_{12}q_{17} - 1792q_{13}q_{16} + 3355968q_{14}q_{15} - 896q_0q_{30} - 896q_1q_{29} - 1792q_2q_{28} - 2688q_3q_{27} - 6711936q_5q_{25} - \\
& 2688q_7q_{23} - 896q_8q_{22} - 2688q_9q_{21} - 2688q_{10}q_{20} - 2688q_{11}q_{19} - 896q_{12}q_{18} - 896q_{13}q_{17} - 1792q_{14}q_{16} - \\
& 1792q_0q_{31} - 1792q_1q_{30} - 1792q_2q_{29} - 896q_3q_{28} - 6711936q_5q_{26} - 6711936q_6q_{25} - 6711936q_7q_{24} - \\
& 896q_8q_{23} - 1792q_9q_{22} - 3584q_{10}q_{21} - 3584q_{11}q_{20} - 1792q_{12}q_{19} - 1792q_{13}q_{18} - 1792q_{14}q_{17} - 896q_{15}q_{16} - \\
& 1792q_0q_{32} - 3584q_1q_{31} - 896q_2q_{30} - 1792q_3q_{29} - 896q_4q_{28} - 2688q_7q_{25} - 896q_8q_{24} - 896q_9q_{23} - \\
& 1792q_{10}q_{22} - 2688q_{11}q_{21} - 1792q_{12}q_{20} - 3584q_{13}q_{19} - 896q_{14}q_{18} - 1792q_{15}q_{17} - 1792q_0q_{33} - 2688q_1q_{32} - \\
& 2688q_2q_{31} - 1792q_3q_{30} - 896q_4q_{29} - 1792q_5q_{28} - 6711936q_6q_{27} - 6711936q_7q_{26} - 1792q_8q_{25} - 1792q_9q_{24} - \\
& 1792q_{10}q_{23} - 896q_{11}q_{22} - 1792q_{12}q_{21} - 2688q_{13}q_{20} - 2688q_{14}q_{19} - 1792q_{15}q_{18} - 896q_0q_{34} - 2688q_1q_{33} - \\
& 2688q_2q_{32} - 2688q_3q_{31} - 896q_4q_{30} - 896q_5q_{29} - 1792q_6q_{28} - 6711936q_7q_{27} - 1792q_8q_{26} - 3584q_9q_{25} - \\
& 896q_{10}q_{24} - 1792q_{11}q_{23} - 896q_{12}q_{22} - 2688q_{13}q_{21} - 2688q_{14}q_{20} - 2688q_{15}q_{19} - 896q_0q_{35} - 1792q_1q_{34} - \\
& 3584q_2q_{33} - 3584q_3q_{32} - 1792q_4q_{31} - 1792q_5q_{30} - 1792q_6q_{29} - 896q_7q_{28} - 1792q_8q_{27} - 2688q_9q_{26} - \\
& 2688q_{10}q_{25} - 1792q_{11}q_{24} - 896q_{12}q_{23} - 1792q_{13}q_{22} - 3584q_{14}q_{21} - 3584q_{15}q_{20} - 896q_0q_{36} - 896q_1q_{35} - \\
& 1792q_2q_{34} - 2688q_3q_{33} - 1792q_4q_{32} - 3584q_5q_{31} - 896q_6q_{30} - 1792q_7q_{29} - 6711936q_8q_{28} - 2688q_9q_{27} - \\
& 2688q_{10}q_{26} - 2688q_{11}q_{25} - 896q_{12}q_{24} - 896q_{13}q_{23} - 1792q_{14}q_{22} - 2688q_{15}q_{21} - 1792q_0q_{37} - 1792q_1q_{36} - \\
& 1792q_2q_{35} - 896q_3q_{34} - 1792q_4q_{33} - 2688q_5q_{32} - 2688q_6q_{31} - 1792q_7q_{30} - 6711936q_8q_{29} - 6711936q_9q_{28} - \\
& 3584q_{10}q_{27} - 3584q_{11}q_{26} - 1792q_{12}q_{25} - 1792q_{13}q_{24} - 1792q_{14}q_{23} - 896q_{15}q_{22} + 5376q_{16}q_{21} - 1792q_0q_{38} - \\
& 3584q_1q_{37} - 896q_2q_{36} - 1792q_3q_{35} - 896q_4q_{34} - 2688q_5q_{33} - 2688q_6q_{32} - 2688q_7q_{31} - 6711936q_8q_{30} - \\
& 2688q_{10}q_{28} - 2688q_{11}q_{27} - 1792q_{12}q_{26} - 3584q_{13}q_{25} - 896q_{14}q_{24} - 1792q_{15}q_{23} + 1792q_{16}q_{22} - 1792q_0q_{39} - \\
& 2688q_1q_{38} - 2688q_2q_{37} - 1792q_3q_{36} - 896q_4q_{35} - 1792q_5q_{34} - 3584q_6q_{33} - 3584q_7q_{32} - 6711936q_{10}q_{29} - \\
& 2688q_{11}q_{28} - 1792q_{12}q_{27} - 2688q_{13}q_{26} - 2688q_{14}q_{25} - 1792q_{15}q_{24} - 2688q_1q_{39} - 2688q_2q_{38} - 2688q_3q_{37} - \\
& 896q_4q_{36} - 896q_5q_{35} - 1792q_6q_{34} - 2688q_7q_{33} - 6711936q_9q_{31} - 2688q_{11}q_{29} - 896q_{12}q_{28} - 2688q_{13}q_{27} - \\
& 2688q_{14}q_{26} - 2688q_{15}q_{25} + 1792q_{17}q_{23} - 3584q_2q_{39} - 3584q_3q_{38} - 1792q_4q_{37} - 1792q_5q_{36} - 1792q_6q_{35} - \\
& 896q_7q_{34} - 6711936q_9q_{32} - 6711936q_{10}q_{31} - 6711936q_{11}q_{30} - 896q_{12}q_{29} - 1792q_{13}q_{28} - 3584q_{14}q_{27} - \\
& 3584q_{15}q_{26} + 1792q_{16}q_{25} + 1792q_{19}q_{22} - 2688q_3q_{39} - 1792q_4q_{38} - 3584q_5q_{37} - 896q_6q_{36} - 1792q_7q_{35} - \\
& 896q_8q_{34} - 2688q_{11}q_{31} - 896q_{12}q_{30} - 896q_{13}q_{29} - 1792q_{14}q_{28} - 2688q_{15}q_{27} + 1792q_{18}q_{24} - 1792q_{19}q_{23} - \\
& 2688q_5q_{38} - 2688q_6q_{37} - 1792q_7q_{36} - 896q_8q_{35} - 1792q_9q_{34} - 6711936q_{10}q_{33} - 6711936q_{11}q_{32} - \\
& 1792q_{12}q_{31} - 1792q_{13}q_{30} - 1792q_{14}q_{29} - 896q_{15}q_{28} + 1792q_{16}q_{27} + 1792q_{17}q_{26} + 1792q_{18}q_{25} + 1792q_{19}q_{24} + \\
& 1792q_{20}q_{23} + 1792q_{21}q_{22} - 2688q_5q_{39} - 2688q_6q_{38} - 2688q_7q_{37} - 896q_8q_{36} - 896q_9q_{35} - 1792q_{10}q_{34} - \\
& 6711936q_{11}q_{33} - 1792q_{12}q_{32} - 3584q_{13}q_{31} - 896q_{14}q_{30} - 1792q_{15}q_{29} + 1792q_{16}q_{28} + 1792q_{17}q_{27} + \\
& 1792q_{18}q_{26} + 3584q_{19}q_{25} + 1792q_{20}q_{24} + 1792q_{21}q_{23} - 3584q_6q_{39} - 3584q_7q_{38} - 1792q_8q_{37} - 1792q_9q_{36} - \\
& 1792q_{10}q_{35} - 896q_{11}q_{34} - 1792q_{12}q_{33} - 2688q_{13}q_{32} - 2688q_{14}q_{31} - 1792q_{15}q_{30} + 1792q_{19}q_{26} + 1792q_{20}q_{25} - \\
& 2688q_7q_{39} - 1792q_8q_{38} - 3584q_9q_{37} - 896q_{10}q_{36} - 1792q_{11}q_{35} - 6711936q_{12}q_{34} - 2688q_{13}q_{33} - 2688q_{14}q_{32} - \\
& 2688q_{15}q_{31} + 1792q_{17}q_{29} + 1792q_{19}q_{27} + 3584q_{20}q_{26} + 1792q_{21}q_{25} - 1792q_8q_{39} - 2688q_9q_{38} - 2688q_{10}q_{37} - \\
& 1792q_{11}q_{36} - 6711936q_{12}q_{35} - 6711936q_{13}q_{34} - 3584q_{14}q_{33} - 3584q_{15}q_{32} + 1792q_{16}q_{31} + 1792q_{19}q_{28} + \\
& 1792q_{20}q_{27} + 1792q_{21}q_{26} - 2688q_9q_{39} - 2688q_{10}q_{38} - 2688q_{11}q_{37} - 6711936q_{12}q_{36} - 2688q_{14}q_{34} - \\
& 2688q_{15}q_{33} + 1792q_{18}q_{30} + 3584q_{21}q_{27} - 3584q_{10}q_{39} - 3584q_{11}q_{38} - 6711936q_{14}q_{35} - 2688q_{15}q_{34} + \\
& 1792q_{16}q_{33} + 1792q_{17}q_{32} + 1792q_{18}q_{31} + 1792q_{19}q_{30} + 1792q_{20}q_{29} + 1792q_{21}q_{28} + 5376q_{22}q_{27} - 2688q_{11}q_{39} - \\
& 6711936q_{13}q_{37} - 2688q_{15}q_{35} + 1792q_{16}q_{34} + 1792q_{17}q_{33} + 1792q_{18}q_{32} + 3584q_{19}q_{31} + 1792q_{20}q_{30} + \\
& 1792q_{21}q_{29} + 1792q_{22}q_{28} - 6711936q_{13}q_{38} - 6711936q_{14}q_{37} - 6711936q_{15}q_{36} + 1792q_{19}q_{32} + 1792q_{20}q_{31} - \\
& 2688q_{15}q_{37} + 1792q_{17}q_{35} + 1792q_{19}q_{33} + 3584q_{20}q_{32} + 1792q_{21}q_{31} + 1792q_{23}q_{29} - 6711936q_{14}q_{39} - \\
& 6711936q_{15}q_{38} + 1792q_{16}q_{37} + 1792q_{19}q_{34} + 1792q_{20}q_{33} + 1792q_{21}q_{32} + 1792q_{22}q_{31} + 1792q_{25}q_{28} - \\
& 6711936q_{15}q_{39} + 1792q_{18}q_{36} + 3584q_{21}q_{33} + 1792q_{24}q_{30} + 1792q_{16}q_{39} + 1792q_{17}q_{38} + 1792q_{18}q_{37} +
\end{aligned}$$

$$\begin{aligned}
&1792q_{19}q_{36} + 1792q_{20}q_{35} + 1792q_{21}q_{34} + 1792q_{22}q_{33} + 1792q_{23}q_{32} + 1792q_{24}q_{31} + 1792q_{25}q_{30} + 1792q_{26}q_{29} + \\
&1792q_{27}q_{28} + 1792q_{17}q_{39} + 1792q_{18}q_{38} + 3584q_{19}q_{37} + 1792q_{20}q_{36} + 1792q_{21}q_{35} + 1792q_{22}q_{34} + 1792q_{23}q_{33} + \\
&1792q_{24}q_{32} + 3584q_{25}q_{31} + 1792q_{26}q_{30} + 1792q_{27}q_{29} + 1792q_{19}q_{38} + 1792q_{20}q_{37} + 1792q_{25}q_{32} + 1792q_{26}q_{31} + \\
&1792q_{19}q_{39} + 3584q_{20}q_{38} + 1792q_{21}q_{37} + 1792q_{23}q_{35} + 1792q_{25}q_{33} + 3584q_{26}q_{32} + 1792q_{27}q_{31} + 1792q_{20}q_{39} + \\
&1792q_{21}q_{38} + 1792q_{22}q_{37} + 1792q_{25}q_{34} + 1792q_{26}q_{33} + 1792q_{27}q_{32} + 3584q_{21}q_{39} + 1792q_{24}q_{36} + 3584q_{27}q_{33} + \\
&1792q_{22}q_{39} + 1792q_{23}q_{38} + 1792q_{24}q_{37} + 1792q_{25}q_{36} + 1792q_{26}q_{35} + 1792q_{27}q_{34} + 5376q_{28}q_{33} + 1792q_{23}q_{39} + \\
&1792q_{24}q_{38} + 3584q_{25}q_{37} + 1792q_{26}q_{36} + 1792q_{27}q_{35} + 1792q_{28}q_{34} + 1792q_{25}q_{38} + 1792q_{26}q_{37} + 1792q_{25}q_{39} + \\
&3584q_{26}q_{38} + 1792q_{27}q_{37} + 1792q_{29}q_{35} + 1792q_{26}q_{39} + 1792q_{27}q_{38} + 1792q_{28}q_{37} + 1792q_{31}q_{34} + 3584q_{27}q_{39} + \\
&1792q_{30}q_{36} + 1792q_{28}q_{39} + 1792q_{29}q_{38} + 1792q_{30}q_{37} + 1792q_{31}q_{36} + 1792q_{32}q_{35} + 1792q_{33}q_{34} + 1792q_{29}q_{39} + \\
&1792q_{30}q_{38} + 3584q_{31}q_{37} + 1792q_{32}q_{36} + 1792q_{33}q_{35} + 1792q_{31}q_{38} + 1792q_{32}q_{37} + 1792q_{31}q_{39} + 3584q_{32}q_{38} + \\
&1792q_{33}q_{37} + 1792q_{32}q_{39} + 1792q_{33}q_{38} + 3584q_{33}q_{39} + 5376q_{34}q_{39} + 32928
\end{aligned}$$

A complete expression of $E_2(s)$ for 28-order Williamson based method or 84-order Baumert-Hall based method by taking $\delta = 3, 355, 968$.

$$\begin{aligned}
E_2(s) = &2521344s_0 + 2523808s_1 + 2524480s_2 + 2525824s_3 + 2521344s_4 + 2523808s_5 + 2524480s_6 + 2525824s_7 + \\
&2521344s_8 + 2523808s_9 + 2524480s_{10} + 2525824s_{11} + 2521344s_{12} + 2523808s_{13} + 2524480s_{14} + 2525824s_{15} - \\
&1681344s_{16} - 1680672s_{17} - 1681344s_{18} - 1683136s_{19} - 1683808s_{20} - 1685152s_{21} - 1681344s_{22} - 1680672s_{23} - \\
&1681344s_{24} - 1683136s_{25} - 1683808s_{26} - 1685152s_{27} - 1681344s_{28} - 1680672s_{29} - 1681344s_{30} - 1683136s_{31} - \\
&1683808s_{32} - 1685152s_{33} - 1681344s_{34} - 1680672s_{35} - 1681344s_{36} - 1683136s_{37} - 1683808s_{38} - 1685152s_{39} + \\
&838992s_{40}s_0 + 838992s_{40}s_2 + 838992s_{40}s_3 + 838992s_{41}s_2 + 336s_{40}s_4 + 838992s_{41}s_3 + 560s_{40}s_5 + 560s_{41}s_4 + 838992s_{42}s_3 + \\
&560s_{40}s_6 + 1008s_{41}s_5 + 560s_{42}s_4 + 560s_{40}s_7 + 896s_{41}s_6 + 896s_{42}s_5 + 560s_{43}s_4 + 336s_{40}s_8 + 896s_{41}s_7 + 1008s_{42}s_6 + 896s_{43}s_5 + \\
&560s_{40}s_9 + 560s_{41}s_8 + 896s_{42}s_7 + 896s_{43}s_6 + 838992s_{44}s_5 + 560s_{40}s_{10} + 1008s_{41}s_9 + 560s_{42}s_8 + 1008s_{43}s_7 + 838992s_{44}s_6 + \\
&560s_{40}s_{11} + 896s_{41}s_{10} + 896s_{42}s_9 + 560s_{43}s_8 + 838992s_{44}s_7 + 838992s_{45}s_6 + 336s_{40}s_{12} + 896s_{41}s_{11} + 1008s_{42}s_{10} + 896s_{43}s_9 + \\
&336s_{44}s_8 + 838992s_{45}s_7 + 560s_{40}s_{13} + 560s_{41}s_{12} + 896s_{42}s_{11} + 896s_{43}s_{10} + 560s_{44}s_9 + 560s_{45}s_8 + 838992s_{46}s_7 + 560s_{40}s_{14} + \\
&1008s_{41}s_{13} + 560s_{42}s_{12} + 1008s_{43}s_{11} + 560s_{44}s_{10} + 1008s_{45}s_9 + 560s_{46}s_8 + 560s_{40}s_{15} + 896s_{41}s_{14} + 896s_{42}s_{13} + 560s_{43}s_{12} + \\
&560s_{44}s_{11} + 896s_{45}s_{10} + 896s_{46}s_9 + 560s_{47}s_8 - 1677984s_{40}s_{16} + 896s_{41}s_{15} + 1008s_{42}s_{14} + 896s_{43}s_{13} + 336s_{44}s_{12} + \\
&896s_{45}s_{11} + 1008s_{46}s_{10} + 896s_{47}s_9 - 1677984s_{40}s_{17} - 1677984s_{41}s_{16} + 896s_{42}s_{15} + 896s_{43}s_{14} + 560s_{44}s_{13} + 560s_{45}s_{12} + \\
&896s_{46}s_{11} + 896s_{47}s_{10} + 838992s_{48}s_9 - 1677984s_{40}s_{18} - 672s_{42}s_{16} + 1008s_{43}s_{15} + 560s_{44}s_{14} + 1008s_{45}s_{13} + 560s_{46}s_{12} + \\
&1008s_{47}s_{11} + 838992s_{48}s_{10} - 1677984s_{42}s_{17} - 672s_{43}s_{16} + 560s_{44}s_{15} + 896s_{45}s_{14} + 896s_{46}s_{13} + 560s_{47}s_{12} + 838992s_{48}s_{11} + \\
&838992s_{49}s_{10} - 1677984s_{41}s_{19} - 672s_{43}s_{17} - 224s_{44}s_{16} + 896s_{45}s_{15} + 1008s_{46}s_{14} + 896s_{47}s_{13} + 336s_{48}s_{12} + 838992s_{49}s_{11} - \\
&1677984s_{41}s_{20} - 1677984s_{42}s_{19} - 1677984s_{43}s_{18} - 224s_{44}s_{17} - 448s_{45}s_{16} + 896s_{46}s_{15} + 896s_{47}s_{14} + 560s_{48}s_{13} + \\
&560s_{49}s_{12} + 838992s_{40}s_{11} - 224s_{40}s_{22} - 672s_{43}s_{19} - 224s_{44}s_{18} - 224s_{45}s_{17} - 448s_{46}s_{16} + 1008s_{47}s_{15} + 560s_{48}s_{14} + \\
&1008s_{49}s_{13} + 560s_{40}s_{12} - 224s_{40}s_{23} - 448s_{41}s_{22} - 1677984s_{42}s_{21} - 1677984s_{43}s_{20} - 448s_{44}s_{19} - 448s_{45}s_{18} - 448s_{46}s_{17} - \\
&224s_{47}s_{16} + 560s_{48}s_{15} + 896s_{49}s_{14} + 896s_{40}s_{13} + 560s_{41}s_{12} - 224s_{40}s_{24} - 224s_{41}s_{23} - 448s_{42}s_{22} - 1677984s_{43}s_{21} - \\
&448s_{44}s_{20} - 896s_{45}s_{19} - 224s_{46}s_{18} - 448s_{47}s_{17} - 224s_{48}s_{16} + 896s_{49}s_{15} + 1008s_{40}s_{14} + 896s_{41}s_{13} - 448s_{40}s_{25} - \\
&448s_{41}s_{24} - 448s_{42}s_{23} - 224s_{43}s_{22} - 448s_{44}s_{21} - 672s_{45}s_{20} - 672s_{46}s_{19} - 448s_{47}s_{18} - 224s_{48}s_{17} - 448s_{49}s_{16} + 896s_{40}s_{15} + \\
&896s_{41}s_{14} + 838992s_{42}s_{12}s_{13} - 448s_{40}s_{26} - 896s_{41}s_{25} - 224s_{42}s_{24} - 448s_{43}s_{23} - 1677984s_{44}s_{22} - 672s_{45}s_{21} - 672s_{46}s_{20} - \\
&672s_{47}s_{19} - 224s_{48}s_{18} - 224s_{49}s_{17} - 448s_{40}s_{16} + 1008s_{41}s_{15} + 838992s_{42}s_{12}s_{14} - 448s_{40}s_{27} - 672s_{41}s_{26} - 672s_{42}s_{25} - \\
&448s_{43}s_{24} - 1677984s_{44}s_{23} - 1677984s_{45}s_{22} - 896s_{46}s_{21} - 896s_{47}s_{20} - 448s_{48}s_{19} - 448s_{49}s_{18} - 448s_{40}s_{17} - 224s_{41}s_{16} + \\
&838992s_{42}s_{12}s_{15} + 838992s_{43}s_{13}s_{14} - 224s_{40}s_{28} - 672s_{41}s_{27} - 672s_{42}s_{26} - 672s_{43}s_{25} - 1677984s_{44}s_{24} - 672s_{46}s_{22} - 672s_{47}s_{21} - \\
&448s_{48}s_{20} - 896s_{49}s_{19} - 224s_{40}s_{18} - 448s_{41}s_{17} - 224s_{42}s_{16} + 838992s_{43}s_{13}s_{15} - 224s_{40}s_{29} - 448s_{41}s_{28} - 896s_{42}s_{27} - \\
&896s_{43}s_{26} - 1677984s_{46}s_{23} - 672s_{47}s_{22} - 448s_{48}s_{21} - 672s_{49}s_{20} - 672s_{40}s_{19} - 448s_{41}s_{18} - 224s_{42}s_{17} - 448s_{43}s_{16} + \\
&838992s_{44}s_{15} - 224s_{40}s_{30} - 224s_{41}s_{29} - 448s_{42}s_{28} - 672s_{43}s_{27} - 1677984s_{45}s_{25} - 672s_{47}s_{23} - 224s_{48}s_{22} - 672s_{49}s_{21} - \\
&672s_{40}s_{20} - 672s_{41}s_{19} - 224s_{42}s_{18} - 224s_{43}s_{17} - 448s_{44}s_{16} - 448s_{40}s_{31} - 448s_{41}s_{30} - 448s_{42}s_{29} - 224s_{43}s_{28} - \\
&1677984s_{45}s_{26} - 1677984s_{46}s_{25} - 1677984s_{47}s_{24} - 224s_{48}s_{23} - 448s_{49}s_{22} - 896s_{40}s_{21} - 896s_{41}s_{20} - 448s_{42}s_{19} - \\
&448s_{43}s_{18} - 448s_{44}s_{17} - 224s_{45}s_{16} - 448s_{40}s_{32} - 896s_{41}s_{31} - 224s_{42}s_{30} - 448s_{43}s_{29} - 224s_{44}s_{28} - 672s_{47}s_{25} - \\
&224s_{48}s_{24} - 224s_{49}s_{23} - 448s_{40}s_{22} - 672s_{41}s_{21} - 448s_{42}s_{20} - 896s_{43}s_{19} - 224s_{44}s_{18} - 448s_{45}s_{17} - 448s_{40}s_{33} - \\
&672s_{41}s_{32} - 672s_{42}s_{31} - 448s_{43}s_{30} - 224s_{44}s_{29} - 448s_{45}s_{28} - 1677984s_{46}s_{27} - 1677984s_{47}s_{26} - 448s_{48}s_{25} - 448s_{49}s_{24} -
\end{aligned}$$

$$\begin{aligned}
& 448s_{10}s_{23} - 224s_{11}s_{22} - 448s_{12}s_{21} - 672s_{13}s_{20} - 672s_{14}s_{19} - 448s_{15}s_{18} - 224s_{0}s_{34} - 672s_1s_{33} - 672s_2s_{32} - \\
& 672s_3s_{31} - 224s_4s_{30} - 224s_5s_{29} - 448s_6s_{28} - 1677984s_7s_{27} - 448s_8s_{26} - 896s_9s_{25} - 224s_{10}s_{24} - 448s_{11}s_{23} - \\
& 224s_{12}s_{22} - 672s_{13}s_{21} - 672s_{14}s_{20} - 672s_{15}s_{19} - 224s_{0}s_{35} - 448s_1s_{34} - 896s_2s_{33} - 896s_3s_{32} - 448s_4s_{31} - \\
& 448s_5s_{30} - 448s_6s_{29} - 224s_7s_{28} - 448s_8s_{27} - 672s_9s_{26} - 672s_{10}s_{25} - 448s_{11}s_{24} - 224s_{12}s_{23} - 448s_{13}s_{22} - \\
& 896s_{14}s_{21} - 896s_{15}s_{20} - 224s_{0}s_{36} - 224s_1s_{35} - 448s_2s_{34} - 672s_3s_{33} - 448s_4s_{32} - 896s_5s_{31} - 224s_6s_{30} - 448s_7s_{29} - \\
& 1677984s_8s_{28} - 672s_9s_{27} - 672s_{10}s_{26} - 672s_{11}s_{25} - 224s_{12}s_{24} - 224s_{13}s_{23} - 448s_{14}s_{22} - 672s_{15}s_{21} - 448s_{0}s_{37} - \\
& 448s_1s_{36} - 448s_2s_{35} - 224s_3s_{34} - 448s_4s_{33} - 672s_5s_{32} - 672s_6s_{31} - 448s_7s_{30} - 1677984s_8s_{29} - 1677984s_9s_{28} - \\
& 896s_{10}s_{27} - 896s_{11}s_{26} - 448s_{12}s_{25} - 448s_{13}s_{24} - 448s_{14}s_{23} - 224s_{15}s_{22} + 1344s_{16}s_{21} - 448s_{0}s_{38} - 896s_1s_{37} - \\
& 224s_2s_{36} - 448s_3s_{35} - 224s_4s_{34} - 672s_5s_{33} - 672s_6s_{32} - 672s_7s_{31} - 1677984s_8s_{30} - 672s_{10}s_{28} - 672s_{11}s_{27} - \\
& 448s_{12}s_{26} - 896s_{13}s_{25} - 224s_{14}s_{24} - 448s_{15}s_{23} + 448s_{16}s_{22} - 448s_{0}s_{39} - 672s_1s_{38} - 672s_2s_{37} - 448s_3s_{36} - \\
& 224s_4s_{35} - 448s_5s_{34} - 896s_6s_{33} - 896s_7s_{32} - 1677984s_{10}s_{29} - 672s_{11}s_{28} - 448s_{12}s_{27} - 672s_{13}s_{26} - 672s_{14}s_{25} - \\
& 448s_{15}s_{24} - 672s_1s_{39} - 672s_2s_{38} - 672s_3s_{37} - 224s_4s_{36} - 224s_5s_{35} - 448s_6s_{34} - 672s_7s_{33} - 1677984s_9s_{31} - \\
& 672s_{11}s_{29} - 224s_{12}s_{28} - 672s_{13}s_{27} - 672s_{14}s_{26} - 672s_{15}s_{25} + 448s_{17}s_{23} - 896s_2s_{39} - 896s_3s_{38} - 448s_4s_{37} - \\
& 448s_5s_{36} - 448s_6s_{35} - 224s_7s_{34} - 1677984s_9s_{32} - 1677984s_{10}s_{31} - 1677984s_{11}s_{30} - 224s_{12}s_{29} - 448s_{13}s_{28} - \\
& 896s_{14}s_{27} - 896s_{15}s_{26} + 448s_{16}s_{25} + 448s_{19}s_{22} - 672s_3s_{39} - 448s_4s_{38} - 896s_5s_{37} - 224s_6s_{36} - 448s_7s_{35} - \\
& 224s_8s_{34} - 672s_{11}s_{31} - 224s_{12}s_{30} - 224s_{13}s_{29} - 448s_{14}s_{28} - 672s_{15}s_{27} + 448s_{18}s_{24} - 448s_4s_{39} - 672s_5s_{38} - \\
& 672s_6s_{37} - 448s_7s_{36} - 224s_8s_{35} - 448s_9s_{34} - 1677984s_{10}s_{33} - 1677984s_{11}s_{32} - 448s_{12}s_{31} - 448s_{13}s_{30} - \\
& 448s_{14}s_{29} - 224s_{15}s_{28} + 448s_{16}s_{27} + 448s_{17}s_{26} + 448s_{18}s_{25} + 448s_{19}s_{24} + 448s_{20}s_{23} + 448s_{21}s_{22} - 672s_5s_{39} - \\
& 672s_6s_{38} - 672s_7s_{37} - 224s_8s_{36} - 224s_9s_{35} - 448s_{10}s_{34} - 1677984s_{11}s_{33} - 448s_{12}s_{32} - 896s_{13}s_{31} - 224s_{14}s_{30} - \\
& 448s_{15}s_{29} + 448s_{16}s_{28} + 448s_{17}s_{27} + 448s_{18}s_{26} + 896s_{19}s_{25} + 448s_{20}s_{24} + 448s_{21}s_{23} - 896s_6s_{39} - 896s_7s_{38} - \\
& 448s_8s_{37} - 448s_9s_{36} - 448s_{10}s_{35} - 224s_{11}s_{34} - 448s_{12}s_{33} - 672s_{13}s_{32} - 672s_{14}s_{31} - 448s_{15}s_{30} + 448s_{19}s_{26} + \\
& 448s_{20}s_{25} - 672s_7s_{39} - 448s_8s_{38} - 896s_9s_{37} - 224s_{10}s_{36} - 448s_{11}s_{35} - 1677984s_{12}s_{34} - 672s_{13}s_{33} - 672s_{14}s_{32} - \\
& 672s_{15}s_{31} + 448s_{17}s_{29} + 448s_{19}s_{27} + 896s_{20}s_{26} + 448s_{21}s_{25} - 448s_8s_{39} - 672s_9s_{38} - 672s_{10}s_{37} - 448s_{11}s_{36} - \\
& 1677984s_{12}s_{35} - 1677984s_{13}s_{34} - 896s_{14}s_{33} - 896s_{15}s_{32} + 448s_{16}s_{31} + 448s_{19}s_{28} + 448s_{20}s_{27} + 448s_{21}s_{26} - \\
& 672s_9s_{39} - 672s_{10}s_{38} - 672s_{11}s_{37} - 1677984s_{12}s_{36} - 672s_{14}s_{34} - 672s_{15}s_{33} + 448s_{18}s_{30} + 896s_{21}s_{27} - 896s_{10}s_{39} - \\
& 896s_{11}s_{38} - 1677984s_{14}s_{35} - 672s_{15}s_{34} + 448s_{16}s_{33} + 448s_{17}s_{32} + 448s_{18}s_{31} + 448s_{19}s_{30} + 448s_{20}s_{29} + 448s_{21}s_{28} + \\
& 1344s_{22}s_{27} - 672s_{11}s_{39} - 1677984s_{13}s_{37} - 672s_{15}s_{35} + 448s_{16}s_{34} + 448s_{17}s_{33} + 448s_{18}s_{32} + 896s_{19}s_{31} + \\
& 448s_{20}s_{30} + 448s_{21}s_{29} + 448s_{22}s_{28} - 1677984s_{13}s_{38} - 1677984s_{14}s_{37} - 1677984s_{15}s_{36} + 448s_{19}s_{32} + 448s_{20}s_{31} - \\
& 672s_{15}s_{37} + 448s_{17}s_{35} + 448s_{19}s_{33} + 896s_{20}s_{32} + 448s_{21}s_{31} + 448s_{23}s_{29} - 1677984s_{14}s_{39} - 1677984s_{15}s_{38} + \\
& 448s_{16}s_{37} + 448s_{19}s_{34} + 448s_{20}s_{33} + 448s_{21}s_{32} + 448s_{22}s_{31} + 448s_{25}s_{28} - 1677984s_{15}s_{39} + 448s_{18}s_{36} + 896s_{21}s_{33} + \\
& 448s_{24}s_{30} + 448s_{16}s_{39} + 448s_{17}s_{38} + 448s_{18}s_{37} + 448s_{19}s_{36} + 448s_{20}s_{35} + 448s_{21}s_{34} + 448s_{22}s_{33} + 448s_{23}s_{32} + \\
& 448s_{24}s_{31} + 448s_{25}s_{30} + 448s_{26}s_{29} + 448s_{27}s_{28} + 448s_{17}s_{39} + 448s_{18}s_{38} + 896s_{19}s_{37} + 448s_{20}s_{36} + 448s_{21}s_{35} + \\
& 448s_{22}s_{34} + 448s_{23}s_{33} + 448s_{24}s_{32} + 896s_{25}s_{31} + 448s_{26}s_{30} + 448s_{27}s_{29} + 448s_{19}s_{38} + 448s_{20}s_{37} + 448s_{25}s_{32} + \\
& 448s_{26}s_{31} + 448s_{19}s_{39} + 896s_{20}s_{38} + 448s_{21}s_{37} + 448s_{23}s_{35} + 448s_{25}s_{33} + 896s_{26}s_{32} + 448s_{27}s_{31} + 448s_{20}s_{39} + \\
& 448s_{21}s_{38} + 448s_{22}s_{37} + 448s_{25}s_{34} + 448s_{26}s_{33} + 448s_{27}s_{32} + 896s_{21}s_{39} + 448s_{24}s_{36} + 896s_{27}s_{33} + 448s_{22}s_{39} + \\
& 448s_{23}s_{38} + 448s_{24}s_{37} + 448s_{25}s_{36} + 448s_{26}s_{35} + 448s_{27}s_{34} + 1344s_{28}s_{33} + 448s_{23}s_{39} + 448s_{24}s_{38} + 896s_{25}s_{37} + \\
& 448s_{26}s_{36} + 448s_{27}s_{35} + 448s_{28}s_{34} + 448s_{25}s_{38} + 448s_{26}s_{37} + 448s_{25}s_{39} + 896s_{26}s_{38} + 448s_{27}s_{37} + 448s_{29}s_{35} + \\
& 448s_{26}s_{39} + 448s_{27}s_{38} + 448s_{28}s_{37} + 448s_{31}s_{34} + 896s_{27}s_{39} + 448s_{30}s_{36} + 448s_{28}s_{39} + 448s_{29}s_{38} + 448s_{30}s_{37} + \\
& 448s_{31}s_{36} + 448s_{32}s_{35} + 448s_{33}s_{34} + 448s_{29}s_{39} + 448s_{30}s_{38} + 896s_{31}s_{37} + 448s_{32}s_{36} + 448s_{33}s_{35} + 448s_{31}s_{38} + \\
& 448s_{32}s_{37} + 448s_{31}s_{39} + 896s_{32}s_{38} + 448s_{33}s_{37} + 448s_{32}s_{39} + 448s_{33}s_{38} + 896s_{33}s_{39} + 1344s_{34}s_{39} + 60445728
\end{aligned}$$

A complete expression of $\hat{H}_2(\hat{\sigma}^z)$ for 28-order Williamson based method or 84-order Baumert-Hall based method

$$\begin{aligned}
\hat{H}_2(\hat{\sigma}^z) = & 2521344\hat{\sigma}_0^z + 2523808\hat{\sigma}_1^z + 2524480\hat{\sigma}_2^z + 2525824\hat{\sigma}_3^z + 2521344\hat{\sigma}_4^z + 2523808\hat{\sigma}_5^z + 2524480\hat{\sigma}_6^z + \\
& 2525824\hat{\sigma}_7^z + 2521344\hat{\sigma}_8^z + 2523808\hat{\sigma}_9^z + 2524480\hat{\sigma}_{10}^z + 2525824\hat{\sigma}_{11}^z + 2521344\hat{\sigma}_{12}^z + 2523808\hat{\sigma}_{13}^z + 2524480\hat{\sigma}_{14}^z + \\
& 2525824\hat{\sigma}_{15}^z - 1681344\hat{\sigma}_{16}^z - 1680672\hat{\sigma}_{17}^z - 1681344\hat{\sigma}_{18}^z - 1683136\hat{\sigma}_{19}^z - 1683808\hat{\sigma}_{20}^z - 1685152\hat{\sigma}_{21}^z - \\
& 1681344\hat{\sigma}_{22}^z - 1680672\hat{\sigma}_{23}^z - 1681344\hat{\sigma}_{24}^z - 1683136\hat{\sigma}_{25}^z - 1683808\hat{\sigma}_{26}^z - 1685152\hat{\sigma}_{27}^z - 1681344\hat{\sigma}_{28}^z - \\
& 1680672\hat{\sigma}_{29}^z - 1681344\hat{\sigma}_{30}^z - 1683136\hat{\sigma}_{31}^z - 1683808\hat{\sigma}_{32}^z - 1685152\hat{\sigma}_{33}^z - 1681344\hat{\sigma}_{34}^z - 1680672\hat{\sigma}_{35}^z -
\end{aligned}$$

[illegible]

$$\begin{aligned} &896\hat{\sigma}_{15}^z\hat{\sigma}_{26}^z+448\hat{\sigma}_{16}^z\hat{\sigma}_{25}^z+448\hat{\sigma}_{19}^z\hat{\sigma}_{22}^z-672\hat{\sigma}_3^z\hat{\sigma}_{39}^z-448\hat{\sigma}_4^z\hat{\sigma}_{38}^z-896\hat{\sigma}_5^z\hat{\sigma}_{37}^z-224\hat{\sigma}_6^z\hat{\sigma}_{36}^z-448\hat{\sigma}_7^z\hat{\sigma}_{35}^z-224\hat{\sigma}_8^z\hat{\sigma}_{34}^z- \\ &672\hat{\sigma}_{11}^z\hat{\sigma}_{31}^z-224\hat{\sigma}_{12}^z\hat{\sigma}_{30}^z-224\hat{\sigma}_{13}^z\hat{\sigma}_{29}^z-448\hat{\sigma}_{14}^z\hat{\sigma}_{28}^z-672\hat{\sigma}_{15}^z\hat{\sigma}_{27}^z+448\hat{\sigma}_{18}^z\hat{\sigma}_{24}^z-448\hat{\sigma}_4^z\hat{\sigma}_{39}^z-672\hat{\sigma}_5^z\hat{\sigma}_{38}^z-672\hat{\sigma}_6^z\hat{\sigma}_{37}^z- \\ &448\hat{\sigma}_7^z\hat{\sigma}_{36}^z-224\hat{\sigma}_8^z\hat{\sigma}_{35}^z-448\hat{\sigma}_9^z\hat{\sigma}_{34}^z-1677984\hat{\sigma}_{10}^z\hat{\sigma}_{33}^z-1677984\hat{\sigma}_{11}^z\hat{\sigma}_{32}^z-448\hat{\sigma}_{12}^z\hat{\sigma}_{31}^z-448\hat{\sigma}_{13}^z\hat{\sigma}_{30}^z-448\hat{\sigma}_{14}^z\hat{\sigma}_{29}^z- \\ &224\hat{\sigma}_{15}^z\hat{\sigma}_{28}^z+448\hat{\sigma}_{16}^z\hat{\sigma}_{27}^z+448\hat{\sigma}_{17}^z\hat{\sigma}_{26}^z+448\hat{\sigma}_{18}^z\hat{\sigma}_{25}^z+448\hat{\sigma}_{19}^z\hat{\sigma}_{24}^z+448\hat{\sigma}_{20}^z\hat{\sigma}_{23}^z+448\hat{\sigma}_{21}^z\hat{\sigma}_{22}^z-672\hat{\sigma}_5^z\hat{\sigma}_{39}^z-672\hat{\sigma}_6^z\hat{\sigma}_{38}^z- \\ &672\hat{\sigma}_7^z\hat{\sigma}_{37}^z-224\hat{\sigma}_8^z\hat{\sigma}_{36}^z-224\hat{\sigma}_9^z\hat{\sigma}_{35}^z-448\hat{\sigma}_{10}^z\hat{\sigma}_{34}^z-1677984\hat{\sigma}_{11}^z\hat{\sigma}_{33}^z-448\hat{\sigma}_{12}^z\hat{\sigma}_{32}^z-896\hat{\sigma}_{13}^z\hat{\sigma}_{31}^z-224\hat{\sigma}_{14}^z\hat{\sigma}_{30}^z- \\ &448\hat{\sigma}_{15}^z\hat{\sigma}_{29}^z+448\hat{\sigma}_{16}^z\hat{\sigma}_{28}^z+448\hat{\sigma}_{17}^z\hat{\sigma}_{27}^z+448\hat{\sigma}_{18}^z\hat{\sigma}_{26}^z+896\hat{\sigma}_{19}^z\hat{\sigma}_{25}^z+448\hat{\sigma}_{20}^z\hat{\sigma}_{24}^z+448\hat{\sigma}_{21}^z\hat{\sigma}_{23}^z-896\hat{\sigma}_6^z\hat{\sigma}_{39}^z-896\hat{\sigma}_7^z\hat{\sigma}_{38}^z- \\ &448\hat{\sigma}_8^z\hat{\sigma}_{37}^z-448\hat{\sigma}_9^z\hat{\sigma}_{36}^z-448\hat{\sigma}_{10}^z\hat{\sigma}_{35}^z-224\hat{\sigma}_{11}^z\hat{\sigma}_{34}^z-448\hat{\sigma}_{12}^z\hat{\sigma}_{33}^z-672\hat{\sigma}_{13}^z\hat{\sigma}_{32}^z-672\hat{\sigma}_{14}^z\hat{\sigma}_{31}^z-448\hat{\sigma}_{15}^z\hat{\sigma}_{30}^z+ \\ &448\hat{\sigma}_{19}^z\hat{\sigma}_{26}^z+448\hat{\sigma}_{20}^z\hat{\sigma}_{25}^z-672\hat{\sigma}_7^z\hat{\sigma}_{39}^z-448\hat{\sigma}_8^z\hat{\sigma}_{38}^z-896\hat{\sigma}_9^z\hat{\sigma}_{37}^z-224\hat{\sigma}_{10}^z\hat{\sigma}_{36}^z-448\hat{\sigma}_{11}^z\hat{\sigma}_{35}^z-1677984\hat{\sigma}_{12}^z\hat{\sigma}_{34}^z- \\ &672\hat{\sigma}_{13}^z\hat{\sigma}_{33}^z-672\hat{\sigma}_{14}^z\hat{\sigma}_{32}^z-672\hat{\sigma}_{15}^z\hat{\sigma}_{31}^z+448\hat{\sigma}_{17}^z\hat{\sigma}_{29}^z+448\hat{\sigma}_{19}^z\hat{\sigma}_{27}^z+896\hat{\sigma}_{20}^z\hat{\sigma}_{26}^z+448\hat{\sigma}_{21}^z\hat{\sigma}_{25}^z-448\hat{\sigma}_8^z\hat{\sigma}_{39}^z- \\ &672\hat{\sigma}_9^z\hat{\sigma}_{38}^z-672\hat{\sigma}_{10}^z\hat{\sigma}_{37}^z-448\hat{\sigma}_{11}^z\hat{\sigma}_{36}^z-1677984\hat{\sigma}_{12}^z\hat{\sigma}_{35}^z-1677984\hat{\sigma}_{13}^z\hat{\sigma}_{34}^z-896\hat{\sigma}_{14}^z\hat{\sigma}_{33}^z-896\hat{\sigma}_{15}^z\hat{\sigma}_{32}^z+448\hat{\sigma}_{16}^z\hat{\sigma}_{31}^z+ \\ &448\hat{\sigma}_{19}^z\hat{\sigma}_{28}^z+448\hat{\sigma}_{20}^z\hat{\sigma}_{27}^z+448\hat{\sigma}_{21}^z\hat{\sigma}_{26}^z-672\hat{\sigma}_9^z\hat{\sigma}_{39}^z-672\hat{\sigma}_{10}^z\hat{\sigma}_{38}^z-672\hat{\sigma}_{11}^z\hat{\sigma}_{37}^z-1677984\hat{\sigma}_{12}^z\hat{\sigma}_{36}^z-672\hat{\sigma}_{14}^z\hat{\sigma}_{34}^z- \\ &672\hat{\sigma}_{15}^z\hat{\sigma}_{33}^z+448\hat{\sigma}_{18}^z\hat{\sigma}_{30}^z+896\hat{\sigma}_{21}^z\hat{\sigma}_{27}^z-896\hat{\sigma}_{10}^z\hat{\sigma}_{39}^z-896\hat{\sigma}_{11}^z\hat{\sigma}_{38}^z-1677984\hat{\sigma}_{14}^z\hat{\sigma}_{35}^z-672\hat{\sigma}_{15}^z\hat{\sigma}_{34}^z+448\hat{\sigma}_{16}^z\hat{\sigma}_{33}^z+ \\ &448\hat{\sigma}_{17}^z\hat{\sigma}_{32}^z+448\hat{\sigma}_{18}^z\hat{\sigma}_{31}^z+448\hat{\sigma}_{19}^z\hat{\sigma}_{30}^z+448\hat{\sigma}_{20}^z\hat{\sigma}_{29}^z+448\hat{\sigma}_{21}^z\hat{\sigma}_{28}^z+1344\hat{\sigma}_{22}^z\hat{\sigma}_{27}^z-672\hat{\sigma}_{11}^z\hat{\sigma}_{39}^z-1677984\hat{\sigma}_{13}^z\hat{\sigma}_{37}^z- \\ &672\hat{\sigma}_{15}^z\hat{\sigma}_{35}^z+448\hat{\sigma}_{16}^z\hat{\sigma}_{34}^z+448\hat{\sigma}_{17}^z\hat{\sigma}_{33}^z+448\hat{\sigma}_{18}^z\hat{\sigma}_{32}^z+896\hat{\sigma}_{19}^z\hat{\sigma}_{31}^z+448\hat{\sigma}_{20}^z\hat{\sigma}_{30}^z+448\hat{\sigma}_{21}^z\hat{\sigma}_{29}^z+448\hat{\sigma}_{22}^z\hat{\sigma}_{28}^z+ \\ &1677984\hat{\sigma}_{13}^z\hat{\sigma}_{38}^z-1677984\hat{\sigma}_{14}^z\hat{\sigma}_{37}^z-1677984\hat{\sigma}_{15}^z\hat{\sigma}_{36}^z+448\hat{\sigma}_{19}^z\hat{\sigma}_{32}^z+448\hat{\sigma}_{20}^z\hat{\sigma}_{31}^z-672\hat{\sigma}_{15}^z\hat{\sigma}_{37}^z+448\hat{\sigma}_{17}^z\hat{\sigma}_{35}^z+ \\ &448\hat{\sigma}_{19}^z\hat{\sigma}_{33}^z+896\hat{\sigma}_{20}^z\hat{\sigma}_{32}^z+448\hat{\sigma}_{21}^z\hat{\sigma}_{31}^z+448\hat{\sigma}_{23}^z\hat{\sigma}_{29}^z-1677984\hat{\sigma}_{14}^z\hat{\sigma}_{39}^z-1677984\hat{\sigma}_{15}^z\hat{\sigma}_{38}^z+448\hat{\sigma}_{16}^z\hat{\sigma}_{37}^z+448\hat{\sigma}_{19}^z\hat{\sigma}_{34}^z+ \\ &448\hat{\sigma}_{20}^z\hat{\sigma}_{33}^z+448\hat{\sigma}_{21}^z\hat{\sigma}_{32}^z+448\hat{\sigma}_{22}^z\hat{\sigma}_{31}^z+448\hat{\sigma}_{25}^z\hat{\sigma}_{28}^z-1677984\hat{\sigma}_{15}^z\hat{\sigma}_{39}^z+448\hat{\sigma}_{18}^z\hat{\sigma}_{36}^z+896\hat{\sigma}_{21}^z\hat{\sigma}_{33}^z+448\hat{\sigma}_{24}^z\hat{\sigma}_{30}^z+ \\ &448\hat{\sigma}_{16}^z\hat{\sigma}_{39}^z+448\hat{\sigma}_{17}^z\hat{\sigma}_{38}^z+448\hat{\sigma}_{18}^z\hat{\sigma}_{37}^z+448\hat{\sigma}_{19}^z\hat{\sigma}_{36}^z+448\hat{\sigma}_{20}^z\hat{\sigma}_{35}^z+448\hat{\sigma}_{21}^z\hat{\sigma}_{34}^z+448\hat{\sigma}_{22}^z\hat{\sigma}_{33}^z+448\hat{\sigma}_{23}^z\hat{\sigma}_{32}^z+ \\ &448\hat{\sigma}_{24}^z\hat{\sigma}_{31}^z+448\hat{\sigma}_{25}^z\hat{\sigma}_{30}^z+448\hat{\sigma}_{26}^z\hat{\sigma}_{29}^z+448\hat{\sigma}_{27}^z\hat{\sigma}_{28}^z+448\hat{\sigma}_{17}^z\hat{\sigma}_{39}^z+448\hat{\sigma}_{18}^z\hat{\sigma}_{38}^z+896\hat{\sigma}_{19}^z\hat{\sigma}_{37}^z+448\hat{\sigma}_{20}^z\hat{\sigma}_{36}^z+ \\ &448\hat{\sigma}_{21}^z\hat{\sigma}_{35}^z+448\hat{\sigma}_{22}^z\hat{\sigma}_{34}^z+448\hat{\sigma}_{23}^z\hat{\sigma}_{33}^z+448\hat{\sigma}_{24}^z\hat{\sigma}_{32}^z+896\hat{\sigma}_{25}^z\hat{\sigma}_{31}^z+448\hat{\sigma}_{26}^z\hat{\sigma}_{30}^z+448\hat{\sigma}_{27}^z\hat{\sigma}_{29}^z+448\hat{\sigma}_{19}^z\hat{\sigma}_{38}^z+ \\ &448\hat{\sigma}_{20}^z\hat{\sigma}_{37}^z+448\hat{\sigma}_{25}^z\hat{\sigma}_{32}^z+448\hat{\sigma}_{26}^z\hat{\sigma}_{31}^z+448\hat{\sigma}_{19}$$

A complete expression of $E_k(s)$ for 36-order Williamson based method or 108-order Baumert-Hall based method

$$\begin{aligned}
 E_k(s) = & 432s_0s_1 + 432s_0s_2 + 288s_0s_3 + 864s_1s_2 + 432s_0s_4 + 720s_1s_3 + 864s_1s_4 + 720s_2s_3 + 864s_2s_4 + 720s_3s_4 + \\
 & 432s_5s_6 + 432s_5s_7 + 288s_5s_8 + 864s_6s_7 + 432s_5s_9 + 720s_6s_8 + 864s_6s_9 + 720s_7s_8 + 864s_7s_9 + 720s_8s_9 + 432s_{10}s_{11} + \\
 & 432s_{10}s_{12} + 288s_{10}s_{13} + 864s_{11}s_{12} + 432s_{10}s_{14} + 720s_{11}s_{13} + 864s_{11}s_{14} + 720s_{12}s_{13} + 864s_{12}s_{14} + 720s_{13}s_{14} + \\
 & 432s_{15}s_{16} + 432s_{15}s_{17} + 288s_{15}s_{18} + 864s_{16}s_{17} + 432s_{15}s_{19} + 720s_{16}s_{18} + 864s_{16}s_{19} + 720s_{17}s_{18} + 864s_{17}s_{19} + \\
 & 720s_{18}s_{19} + 432s_0s_1s_2s_3 + 432s_0s_1s_3s_4 + 432s_0s_2s_3s_4 + 432s_1s_2s_3s_4 + 144s_0s_1s_5s_6 + 144s_0s_1s_6s_7 + 144s_0s_2s_5s_7 + \\
 & 144s_1s_2s_5s_6 + 144s_0s_1s_7s_8 + 144s_0s_2s_6s_8 + 144s_0s_3s_5s_8 + 144s_0s_3s_6s_7 + 144s_1s_2s_5s_8 + 288s_1s_2s_6s_7 + 144s_1s_3s_5s_7 + \\
 & 144s_2s_3s_5s_6 + 144s_0s_1s_8s_9 + 144s_0s_2s_7s_9 + 144s_0s_3s_6s_9 + 144s_0s_4s_5s_9 + 144s_0s_4s_6s_8 + 144s_1s_2s_6s_9 + 144s_1s_2s_7s_8 + \\
 & 144s_1s_3s_5s_9 + 288s_1s_3s_6s_8 + 144s_1s_4s_5s_8 + 144s_1s_4s_6s_7 + 144s_2s_3s_6s_7 + 144s_2s_4s_5s_7 + 144s_3s_4s_5s_6 + 144s_0s_2s_8s_9 + \\
 & 144s_0s_3s_7s_9 + 144s_0s_4s_6s_9 + 144s_0s_4s_7s_8 + 144s_1s_2s_7s_9 + 144s_1s_3s_6s_9 + 144s_1s_3s_7s_8 + 144s_1s_4s_5s_9 + 144s_1s_4s_6s_8 + \\
 & 144s_2s_3s_5s_9 + 144s_2s_3s_6s_8 + 144s_2s_4s_5s_8 + 144s_2s_4s_6s_7 + 144s_3s_4s_5s_7 + 144s_1s_2s_8s_9 + 144s_1s_3s_7s_9 + 288s_1s_4s_6s_9 + \\
 & 144s_1s_4s_7s_8 + 144s_2s_3s_6s_9 + 288s_2s_3s_7s_8 + 144s_2s_4s_6s_8 + 144s_3s_4s_6s_7 + 144s_1s_3s_8s_9 + 144s_1s_4s_7s_9 + 144s_2s_4s_6s_9 + \\
 & 144s_3s_4s_6s_8 + 144s_0s_1s_{10}s_{11} + 144s_2s_3s_8s_9 + 288s_2s_4s_7s_9 + 144s_3s_4s_7s_8 + 144s_2s_4s_8s_9 + 144s_3s_4s_7s_9 + \\
 & 144s_0s_1s_{11}s_{12} + 144s_0s_2s_{10}s_{12} + 144s_1s_2s_{10}s_{11} + 288s_3s_4s_8s_9 + 144s_0s_1s_{12}s_{13} + 144s_0s_2s_{11}s_{13} + 144s_0s_3s_{10}s_{13} + \\
 & 144s_0s_3s_{11}s_{12} + 144s_1s_2s_{10}s_{13} + 288s_1s_2s_{11}s_{12} + 144s_1s_3s_{10}s_{12} + 144s_2s_3s_{10}s_{11} + 432s_5s_6s_7s_8 + 144s_0s_1s_{13}s_{14} + \\
 & 144s_0s_2s_{12}s_{14} + 144s_0s_3s_{11}s_{14} + 144s_0s_4s_{10}s_{14} + 144s_0s_4s_{11}s_{13} + 144s_1s_2s_{11}s_{14} + 144s_1s_2s_{12}s_{13} + 144s_1s_3s_{10}s_{14} + \\
 & 288s_1s_3s_{11}s_{13} + 144s_1s_4s_{10}s_{13} + 144s_1s_4s_{11}s_{12} + 144s_2s_3s_{11}s_{12} + 144s_2s_4s_{10}s_{12} + 144s_3s_4s_{10}s_{11} + 432s_5s_6s_8s_9 + \\
 & 144s_0s_2s_{13}s_{14} + 144s_0s_3s_{12}s_{14} + 144s_0s_4s_{11}s_{14} + 144s_0s_4s_{12}s_{13} + 144s_1s_2s_{12}s_{14} + 144s_1s_3s_{11}s_{14} + 144s_1s_3s_{12}s_{13} + \\
 & 144s_1s_4s_{10}s_{14} + 144s_1s_4s_{11}s_{13} + 144s_2s_3s_{10}s_{14} + 144s_2s_3s_{11}s_{13} + 144s_2s_4s_{10}s_{13} + 144s_2s_4s_{11}s_{12} + 144s_3s_4s_{10}s_{12} + \\
 & 432s_5s_7s_8s_9 + 144s_1s_2s_{13}s_{14} + 144s_1s_3s_{12}s_{14} + 288s_1s_4s_{11}s_{14} + 144s_1s_4s_{12}s_{13} + 144s_2s_3s_{11}s_{14} + 288s_2s_3s_{12}s_{13} + \\
 & 144s_2s_4s_{11}s_{13} + 144s_3s_4s_{11}s_{12} + 432s_6s_7s_8s_9 + 144s_1s_3s_{13}s_{14} + 144s_1s_4s_{12}s_{14} + 144s_2s_4s_{11}s_{14} + 144s_3s_4s_{11}s_{13} + \\
 & 144s_0s_1s_{15}s_{16} + 144s_2s_3s_{13}s_{14} + 288s_2s_4s_{12}s_{14} + 144s_3s_4s_{12}s_{13} + 144s_5s_6s_{10}s_{11} + 144s_2s_4s_{13}s_{14} + 144s_3s_4s_{12}s_{14} + \\
 & 144s_0s_1s_{16}s_{17} + 144s_0s_2s_{15}s_{17} + 144s_1s_2s_{15}s_{16} + 288s_3s_4s_{13}s_{14} + 144s_5s_6s_{11}s_{12} + 144s_5s_7s_{10}s_{12} + 144s_6s_7s_{10}s_{11} + \\
 & 144s_0s_1s_{17}s_{18} + 144s_0s_2s_{16}s_{18} + 144s_0s_3s_{15}s_{18} + 144s_0s_3s_{16}s_{17} + 144s_1s_2s_{15}s_{18} + 288s_1s_2s_{16}s_{17} + 144s_1s_3s_{15}s_{17} + \\
 & 144s_2s_3s_{15}s_{16} + 144s_5s_6s_{12}s_{13} + 144s_5s_7s_{11}s_{13} + 144s_5s_8s_{10}s_{13} + 144s_5s_8s_{11}s_{12} + 144s_6s_7s_{10}s_{13} + 288s_6s_7s_{11}s_{12} + \\
 & 144s_6s_8s_{10}s_{12} + 144s_7s_8s_{10}s_{11} + 144s_0s_1s_{18}s_{19} + 144s_0s_2s_{17}s_{19} + 144s_0s_3s_{16}s_{19} + 144s_0s_4s_{15}s_{19} + 144s_0s_4s_{16}s_{18} + \\
 & 144s_1s_2s_{16}s_{19} + 144s_1s_2s_{17}s_{18} + 144s_1s_3s_{15}s_{19} + 288s_1s_3s_{16}s_{18} + 144s_1s_4s_{15}s_{18} + 144s_1s_4s_{16}s_{17} + 144s_2s_3s_{16}s_{17} + \\
 & 144s_2s_4s_{15}s_{17} + 144s_3s_4s_{15}s_{16} + 144s_5s_6s_{13}s_{14} + 144s_5s_7s_{12}s_{14} + 144s_5s_8s_{11}s_{14} + 144s_5s_9s_{10}s_{14} + 144s_5s_9s_{11}s_{13} + \\
 & 144s_6s_7s_{11}s_{14} + 144s_6s_7s_{12}s_{13} + 144s_6s_8s_{10}s_{14} + 288s_6s_8s_{11}s_{13} + 144s_6s_9s_{10}s_{13} + 144s_6s_9s_{11}s_{12} + 144s_7s_8s_{11}s_{12} + \\
 & 144s_7s_9s_{10}s_{12} + 144s_8s_9s_{10}s_{11} + 144s_0s_2s_{18}s_{19} + 144s_0s_3s_{17}s_{19} + 144s_0s_4s_{16}s_{19} + 144s_0s_4s_{17}s_{18} + 144s_1s_2s_{17}s_{19} + \\
 & 144s_1s_3s_{16}s_{19} + 144s_1s_3s_{17}s_{18} + 144s_1s_4s_{15}s_{19} + 144s_1s_4s_{16}s_{18} + 144s_2s_3s_{15}s_{19} + 144s_2s_3s_{16}s_{18} + 144s_2s_4s_{15}s_{18} + \\
 & 144s_2s_4s_{16}s_{17} + 144s_3s_4s_{15}s_{17} + 144s_5s_7s_{13}s_{14} + 144s_5s_8s_{12}s_{14} + 144s_5s_9s_{11}s_{14} + 144s_5s_9s_{12}s_{13} + 144s_6s_7s_{12}s_{14} + \\
 & 144s_6s_8s_{11}s_{14} + 144s_6s_8s_{12}s_{13} + 144s_6s_9s_{10}s_{14} + 144s_6s_9s_{11}s_{13} + 144s_7s_8s_{10}s_{14} + 144s_7s_8s_{11}s_{13} + 144s_7s_9s_{10}s_{13} + \\
 & 144s_7s_9s_{11}s_{12} + 144s_8s_9s_{10}s_{12} + 144s_1s_2s_{18}s_{19} + 144s_1s_3s_{17}s_{19} + 288s_1s_4s_{16}s_{19} + 144s_1s_4s_{17}s_{18} + 144s_2s_3s_{16}s_{19} + \\
 & 288s_2s_3s_{17}s_{18} + 144s_2s_4s_{16}s_{18} + 144s_3s_4s_{16}s_{17} + 144s_6s_7s_{13}s_{14} + 144s_6s_8s_{12}s_{14} + 288s_6s_9s_{11}s_{14} + 144s_6s_9s_{12}s_{13} + \\
 & 144s_7s_8s_{11}s_{14} + 288s_7s_8s_{12}s_{13} + 144s_7s_9s_{11}s_{13} + 144s_8s_9s_{11}s_{12} + 144s_1s_3s_{18}s_{19} + 144s_1s_4s_{17}s_{19} + 144s_2s_4s_{16}s_{19} + \\
 & 144s_3s_4s_{16}s_{18} + 144s_6s_8s_{13}s_{14} + 144s_6s_9s_{12}s_{14} + 144s_7s_9s_{11}s_{14} + 144s_8s_9s_{11}s_{13} + 144s_2s_3s_{18}s_{19} + 288s_2s_4s_{17}s_{19} + \\
 & 144s_3s_4s_{17}s_{18} + 144s_5s_6s_{15}s_{16} + 144s_7s_8s_{13}s_{14} + 288s_7s_9s_{12}s_{14} + 144s_8s_9s_{12}s_{13} + 144s_2s_4s_{18}s_{19} + 144s_3s_4s_{17}s_{19} + \\
 & 144s_7s_9s_{13}s_{14} + 144s_8s_9s_{12}s_{14} + 288s_3s_4s_{18}s_{19} + 144s_5s_6s_{16}s_{17} + 144s_5s_7s_{15}s_{17} + 144s_6s_7s_{15}s_{16} + 288s_8s_9s_{13}s_{14} + \\
 & 144s_5s_6s_{17}s_{18} + 144s_5s_7s_{16}s_{18} + 144s_5s_8s_{15}s_{18} + 144s_5s_8s_{16}s_{17} + 144s_6s_7s_{15}s_{18} + 288s_6s_7s_{16}s_{17} + 144s_6s_8s_{15}s_{17} + \\
 & 144s_7s_8s_{15}s_{16} + 432s_{10}s_{11}s_{12}s_{13} + 144s_5s_6s_{18}s_{19} + 144s_5s_7s_{17}s_{19} + 144s_5s_8s_{16}s_{19} + 144s_5s_9s_{15}s_{19} + 144s_5s_9s_{16}s_{18} + \\
 & 144s_6s_7s_{16}s_{19} + 144s_6s_7s_{17}s_{18} + 144s_6s_8s_{15}s_{19} + 288s_6s_8s_{16}s_{18} + 144s_6s_9s_{15}s_{18} + 144s_6s_9s_{16}s_{17} + 144s_7s_8s_{16}s_{17} + \\
 & 144s_7s_9s_{15}s_{17} + 144s_8s_9s_{15}s_{16} + 432s_{10}s_{11}s_{13}s_{14} + 144s_5s_7s_{18}s_{19} + 144s_5s_8s_{17}s_{19} + 144s_5s_9s_{16}s_{19} + 144s_5s_9s_{17}s_{18} + \\
 & 144s_6s_7s_{17}s_{19} + 144s_6s_8s_{16}s_{19} + 144s_6s_8s_{17}s_{18} + 144s_6s_9s_{15}s_{19} + 144s_6s_9s_{16}s_{18} + 144s_7s_8s_{15}s_{19} + 144s_7s_8s_{16}s_{18} + \\
 & 144s_7s_9s_{15}s_{18} + 144s_7s_9s_{16}s_{17} + 144s_8s_9s_{15}s_{17} + 432s_{10}s_{12}s_{13}s_{14} + 144s_6s_7s_{18}s_{19} + 144s_6s_8s_{17}s_{19} + 288s_6s_9s_{16}s_{19} + \\
 & 144s_6s_9s_{17}s_{18} + 144s_7s_8s_{16}s_{19} + 288s_7s_8s_{17}s_{18} + 144s_7s_9s_{16}s_{18} + 144s_8s_9s_{16}s_{17} + 432s_{11}s_{12}s_{13}s_{14} + 144s_6s_8s_{18}s_{19} +
 \end{aligned}$$

$$\begin{aligned}
& 144s_6s_9s_{17}s_{19} + 144s_7s_9s_{16}s_{19} + 144s_8s_9s_{16}s_{18} + 144s_7s_8s_{18}s_{19} + 288s_7s_9s_{17}s_{19} + 144s_8s_9s_{17}s_{18} + 144s_{10}s_{11}s_{15}s_{16} + \\
& 144s_7s_9s_{18}s_{19} + 144s_8s_9s_{17}s_{19} + 288s_8s_9s_{18}s_{19} + 144s_{10}s_{11}s_{16}s_{17} + 144s_{10}s_{12}s_{15}s_{17} + 144s_{11}s_{12}s_{15}s_{16} + \\
& 144s_{10}s_{11}s_{17}s_{18} + 144s_{10}s_{12}s_{16}s_{18} + 144s_{10}s_{13}s_{15}s_{18} + 144s_{10}s_{13}s_{16}s_{17} + 144s_{11}s_{12}s_{15}s_{18} + 288s_{11}s_{12}s_{16}s_{17} + \\
& 144s_{11}s_{13}s_{15}s_{17} + 144s_{12}s_{13}s_{15}s_{16} + 144s_{10}s_{11}s_{18}s_{19} + 144s_{10}s_{12}s_{17}s_{19} + 144s_{10}s_{13}s_{16}s_{19} + 144s_{10}s_{14}s_{15}s_{19} + \\
& 144s_{10}s_{14}s_{16}s_{18} + 144s_{11}s_{12}s_{16}s_{19} + 144s_{11}s_{12}s_{17}s_{18} + 144s_{11}s_{13}s_{15}s_{19} + 288s_{11}s_{13}s_{16}s_{18} + 144s_{11}s_{14}s_{15}s_{18} + \\
& 144s_{11}s_{14}s_{16}s_{17} + 144s_{12}s_{13}s_{16}s_{17} + 144s_{12}s_{14}s_{15}s_{17} + 144s_{13}s_{14}s_{15}s_{16} + 144s_{10}s_{12}s_{18}s_{19} + 144s_{10}s_{13}s_{17}s_{19} + \\
& 144s_{10}s_{14}s_{16}s_{19} + 144s_{10}s_{14}s_{17}s_{18} + 144s_{11}s_{12}s_{17}s_{19} + 144s_{11}s_{13}s_{16}s_{19} + 144s_{11}s_{13}s_{17}s_{18} + 144s_{11}s_{14}s_{15}s_{19} + \\
& 144s_{11}s_{14}s_{16}s_{18} + 144s_{12}s_{13}s_{15}s_{19} + 144s_{12}s_{13}s_{16}s_{18} + 144s_{12}s_{14}s_{15}s_{18} + 144s_{12}s_{14}s_{16}s_{17} + 144s_{13}s_{14}s_{15}s_{17} + \\
& 144s_{11}s_{12}s_{18}s_{19} + 144s_{11}s_{13}s_{17}s_{19} + 288s_{11}s_{14}s_{16}s_{19} + 144s_{11}s_{14}s_{17}s_{18} + 144s_{12}s_{13}s_{16}s_{19} + 288s_{12}s_{13}s_{17}s_{18} + \\
& 144s_{12}s_{14}s_{16}s_{18} + 144s_{13}s_{14}s_{16}s_{17} + 144s_{11}s_{13}s_{18}s_{19} + 144s_{11}s_{14}s_{17}s_{19} + 144s_{12}s_{14}s_{16}s_{19} + 144s_{13}s_{14}s_{16}s_{18} + \\
& 144s_{12}s_{13}s_{18}s_{19} + 288s_{12}s_{14}s_{17}s_{19} + 144s_{13}s_{14}s_{17}s_{18} + 144s_{12}s_{14}s_{18}s_{19} + 144s_{13}s_{14}s_{17}s_{19} + 288s_{13}s_{14}s_{18}s_{19} + \\
& 432s_{15}s_{16}s_{17}s_{18} + 432s_{15}s_{16}s_{18}s_{19} + 432s_{15}s_{17}s_{18}s_{19} + 432s_{16}s_{17}s_{18}s_{19} + 5760
\end{aligned}$$

A complete expression of $E_k(q)$ for 36-order Williamson based method or 108-order Baumert-Hall based method

$$\begin{aligned}
E_k(q) = & 12096q_0q_1 - 32544q_1 - 32544q_2 - 32544q_3 - 32544q_4 - 19584q_5 - 32544q_6 - 32544q_7 - 32544q_8 - \\
& 32544q_9 - 19584q_{10} - 32544q_{11} - 32544q_{12} - 32544q_{13} - 32544q_{14} - 19584q_{15} - 32544q_{16} - 32544q_{17} - \\
& 32544q_{18} - 32544q_{19} - 19584q_0 + 12096q_0q_2 + 13248q_0q_3 + 20736q_1q_2 + 12096q_0q_4 + 21888q_1q_3 + \\
& 2304q_0q_5 + 20736q_1q_4 + 21888q_2q_3 + 4032q_0q_6 + 4032q_1q_5 + 20736q_2q_4 + 4032q_0q_7 + 7488q_1q_6 + \\
& 4032q_2q_5 + 21888q_3q_4 + 4032q_0q_8 + 6912q_1q_7 + 6912q_2q_6 + 4032q_3q_5 + 4032q_0q_9 + 6912q_1q_8 + 7488q_2q_7 + \\
& 6912q_3q_6 + 4032q_4q_5 + 2304q_0q_{10} + 6912q_1q_9 + 6912q_2q_8 + 6912q_3q_7 + 6912q_4q_6 + 4032q_0q_{11} + 4032q_1q_{10} + \\
& 6912q_2q_9 + 7488q_3q_8 + 6912q_4q_7 + 12096q_5q_6 + 4032q_0q_{12} + 7488q_1q_{11} + 4032q_2q_{10} + 6912q_3q_9 + 6912q_4q_8 + \\
& 12096q_5q_7 + 4032q_0q_{13} + 6912q_1q_{12} + 6912q_2q_{11} + 4032q_3q_{10} + 7488q_4q_9 + 13248q_5q_8 + 20736q_6q_7 + \\
& 4032q_0q_{14} + 6912q_1q_{13} + 7488q_2q_{12} + 6912q_3q_{11} + 4032q_4q_{10} + 12096q_5q_9 + 21888q_6q_8 + 2304q_0q_{15} + \\
& 6912q_1q_{14} + 6912q_2q_{13} + 6912q_3q_{12} + 6912q_4q_{11} + 2304q_5q_{10} + 20736q_6q_9 + 21888q_7q_8 + 4032q_0q_{16} + \\
& 4032q_1q_{15} + 6912q_2q_{14} + 7488q_3q_{13} + 6912q_4q_{12} + 4032q_5q_{11} + 4032q_6q_{10} + 20736q_7q_9 + 4032q_0q_{17} + \\
& 7488q_1q_{16} + 4032q_2q_{15} + 6912q_3q_{14} + 6912q_4q_{13} + 4032q_5q_{12} + 7488q_6q_{11} + 4032q_7q_{10} + 21888q_8q_9 + \\
& 4032q_0q_{18} + 6912q_1q_{17} + 6912q_2q_{16} + 4032q_3q_{15} + 7488q_4q_{14} + 4032q_5q_{13} + 6912q_6q_{12} + 6912q_7q_{11} + \\
& 4032q_8q_{10} + 4032q_0q_{19} + 6912q_1q_{18} + 7488q_2q_{17} + 6912q_3q_{16} + 4032q_4q_{15} + 4032q_5q_{14} + 6912q_6q_{13} + \\
& 7488q_7q_{12} + 6912q_8q_{11} + 4032q_9q_{10} + 6912q_1q_{19} + 6912q_2q_{18} + 6912q_3q_{17} + 6912q_4q_{16} + 2304q_5q_{15} + \\
& 6912q_6q_{14} + 6912q_7q_{13} + 6912q_8q_{12} + 6912q_9q_{11} + 6912q_2q_{19} + 7488q_3q_{18} + 6912q_4q_{17} + 4032q_5q_{16} + \\
& 4032q_6q_{15} + 6912q_7q_{14} + 7488q_8q_{13} + 6912q_9q_{12} + 12096q_{10}q_{11} + 6912q_3q_{19} + 6912q_4q_{18} + 4032q_5q_{17} + \\
& 7488q_6q_{16} + 4032q_7q_{15} + 6912q_8q_{14} + 6912q_9q_{13} + 12096q_{10}q_{12} + 7488q_4q_{19} + 4032q_5q_{18} + 6912q_6q_{17} + \\
& 6912q_7q_{16} + 4032q_8q_{15} + 7488q_9q_{14} + 13248q_{10}q_{13} + 20736q_{11}q_{12} + 4032q_5q_{19} + 6912q_6q_{18} + 7488q_7q_{17} + \\
& 6912q_8q_{16} + 4032q_9q_{15} + 12096q_{10}q_{14} + 21888q_{11}q_{13} + 6912q_6q_{19} + 6912q_7q_{18} + 6912q_8q_{17} + 6912q_9q_{16} + \\
& 2304q_{10}q_{15} + 20736q_{11}q_{14} + 21888q_{12}q_{13} + 6912q_7q_{19} + 7488q_8q_{18} + 6912q_9q_{17} + 4032q_{10}q_{16} + 4032q_{11}q_{15} + \\
& 20736q_{12}q_{14} + 6912q_8q_{19} + 6912q_9q_{18} + 4032q_{10}q_{17} + 7488q_{11}q_{16} + 4032q_{12}q_{15} + 21888q_{13}q_{14} + 7488q_9q_{19} + \\
& 4032q_{10}q_{18} + 6912q_{11}q_{17} + 6912q_{12}q_{16} + 4032q_{13}q_{15} + 4032q_{10}q_{19} + 6912q_{11}q_{18} + 7488q_{12}q_{17} + 6912q_{13}q_{16} + \\
& 4032q_{14}q_{15} + 6912q_{11}q_{19} + 6912q_{12}q_{18} + 6912q_{13}q_{17} + 6912q_{14}q_{16} + 6912q_{12}q_{19} + 7488q_{13}q_{18} + 6912q_{14}q_{17} + \\
& 12096q_{15}q_{16} + 6912q_{13}q_{19} + 6912q_{14}q_{18} + 12096q_{15}q_{17} + 7488q_{14}q_{19} + 13248q_{15}q_{18} + 20736q_{16}q_{17} + \\
& 12096q_{15}q_{19} + 21888q_{16}q_{18} + 20736q_{16}q_{19} + 21888q_{17}q_{18} + 20736q_{17}q_{19} + 21888q_{18}q_{19} - 3456q_0q_1q_2 - \\
& 6912q_0q_1q_3 - 3456q_0q_1q_4 - 6912q_0q_2q_3 - 1152q_0q_1q_5 - 3456q_0q_2q_4 - 6912q_1q_2q_3 - 2304q_0q_1q_6 - \\
& 1152q_0q_2q_5 - 6912q_0q_3q_4 - 3456q_1q_2q_4 - 2304q_0q_1q_7 - 1152q_0q_2q_6 - 1152q_0q_3q_5 - 2304q_1q_2q_5 - \\
& 6912q_1q_3q_4 - 2304q_0q_1q_8 - 2304q_0q_2q_7 - 2304q_0q_3q_6 - 1152q_0q_4q_5 - 4608q_1q_2q_6 - 2304q_1q_3q_5 - \\
& 6912q_2q_3q_4 - 1152q_0q_1q_9 - 2304q_0q_2q_8 - 2304q_0q_3q_7 - 2304q_0q_4q_6 - 4608q_1q_2q_7 - 3456q_1q_3q_6 - \\
& 2304q_1q_4q_5 - 2304q_2q_3q_5 - 1152q_0q_1q_{10} - 2304q_0q_2q_9 - 1152q_0q_3q_8 - 1152q_0q_4q_7 - 1152q_0q_5q_6 - \\
& 3456q_1q_2q_8 - 3456q_1q_3q_7 - 4608q_1q_4q_6 - 4608q_2q_3q_6 - 2304q_2q_4q_5 - 2304q_0q_1q_{11} - 1152q_0q_2q_{10} - \\
& 2304q_0q_3q_9 - 2304q_0q_4q_8 - 1152q_0q_5q_7 - 3456q_1q_2q_9 - 4608q_1q_3q_8 - 3456q_1q_4q_7 - 2304q_1q_5q_6 -
\end{aligned}$$

$3456q_2q_3q_7 - 3456q_2q_4q_6 - 2304q_3q_4q_5 - 2304q_0q_1q_{12} - 1152q_0q_2q_{11} - 1152q_0q_3q_{10} - 2304q_0q_4q_9 -$
 $1152q_0q_5q_8 - 2304q_0q_6q_7 - 2304q_1q_2q_{10} - 4608q_1q_3q_9 - 3456q_1q_4q_8 - 1152q_1q_5q_7 - 4608q_2q_3q_8 -$
 $4608q_2q_4q_7 - 2304q_2q_5q_6 - 3456q_3q_4q_6 - 2304q_0q_1q_{13} - 2304q_0q_2q_{12} - 2304q_0q_3q_{11} - 1152q_0q_4q_{10} -$
 $1152q_0q_5q_9 - 2304q_0q_6q_8 - 4608q_1q_2q_{11} - 2304q_1q_3q_{10} - 4608q_1q_4q_9 - 2304q_1q_5q_8 - 4608q_1q_6q_7 -$
 $3456q_2q_3q_9 - 3456q_2q_4q_8 - 2304q_2q_5q_7 - 4608q_3q_4q_7 - 2304q_3q_5q_6 - 1152q_0q_1q_{14} - 2304q_0q_2q_{13} -$
 $2304q_0q_3q_{12} - 2304q_0q_4q_{11} - 2304q_0q_6q_9 - 2304q_0q_7q_8 - 4608q_1q_2q_{12} - 3456q_1q_3q_{11} - 2304q_1q_4q_{10} -$
 $2304q_1q_5q_9 - 3456q_1q_6q_8 - 2304q_2q_3q_{10} - 4608q_2q_4q_9 - 2304q_2q_5q_8 - 4608q_2q_6q_7 - 4608q_3q_4q_8 -$
 $2304q_3q_5q_7 - 1152q_4q_5q_6 - 1152q_0q_1q_{15} - 2304q_0q_2q_{14} - 1152q_0q_3q_{13} - 1152q_0q_4q_{12} - 2304q_0q_7q_9 -$
 $3456q_1q_2q_{13} - 3456q_1q_3q_{12} - 4608q_1q_4q_{11} - 4608q_1q_6q_9 - 4608q_1q_7q_8 - 4608q_2q_3q_{11} - 2304q_2q_4q_{10} -$
 $1152q_2q_5q_9 - 3456q_2q_6q_8 - 3456q_3q_4q_9 - 1152q_3q_5q_8 - 3456q_3q_6q_7 - 2304q_4q_5q_7 - 2304q_0q_1q_{16} -$
 $1152q_0q_2q_{15} - 2304q_0q_3q_{14} - 2304q_0q_4q_{13} - 2304q_0q_8q_9 - 3456q_1q_2q_{14} - 4608q_1q_3q_{13} - 3456q_1q_4q_{12} -$
 $3456q_1q_7q_9 - 3456q_2q_3q_{12} - 3456q_2q_4q_{11} - 3456q_2q_6q_9 - 3456q_2q_7q_8 - 2304q_3q_4q_{10} - 2304q_3q_5q_9 -$
 $4608q_3q_6q_8 - 2304q_4q_5q_8 - 3456q_4q_6q_7 - 2304q_0q_1q_{17} - 1152q_0q_2q_{16} - 1152q_0q_3q_{15} - 2304q_0q_4q_{14} -$
 $2304q_1q_2q_{15} - 4608q_1q_3q_{14} - 3456q_1q_4q_{13} - 3456q_1q_8q_9 - 4608q_2q_3q_{13} - 4608q_2q_4q_{12} - 4608q_2q_7q_9 -$
 $3456q_3q_4q_{11} - 3456q_3q_6q_9 - 4608q_3q_7q_8 - 2304q_4q_5q_9 - 4608q_4q_6q_8 - 3456q_5q_6q_7 - 2304q_0q_1q_{18} -$
 $2304q_0q_2q_{17} - 2304q_0q_3q_{16} - 1152q_0q_4q_{15} - 4608q_1q_2q_{16} - 2304q_1q_3q_{15} - 4608q_1q_4q_{14} - 3456q_2q_3q_{14} -$
 $3456q_2q_4q_{13} - 4608q_2q_8q_9 - 4608q_3q_4q_{12} - 3456q_3q_7q_9 - 4608q_4q_6q_9 - 3456q_4q_7q_8 - 6912q_5q_6q_8 -$
 $1152q_0q_1q_{19} - 2304q_0q_2q_{18} - 2304q_0q_3q_{17} - 2304q_0q_4q_{16} - 4608q_1q_2q_{17} - 3456q_1q_3q_{16} - 2304q_1q_4q_{15} -$
 $2304q_2q_3q_{15} - 4608q_2q_4q_{14} - 4608q_3q_4q_{13} - 4608q_3q_8q_9 - 4608q_4q_7q_9 - 3456q_5q_6q_9 - 6912q_5q_7q_8 -$
 $2304q_0q_2q_{19} - 1152q_0q_3q_{18} - 1152q_0q_4q_{17} - 1152q_0q_{10}q_{11} - 3456q_1q_2q_{18} - 3456q_1q_3q_{17} - 4608q_1q_4q_{16} -$
 $4608q_2q_3q_{16} - 2304q_2q_4q_{15} - 3456q_3q_4q_{14} - 3456q_4q_8q_9 - 1152q_5q_6q_{10} - 3456q_5q_7q_9 - 6912q_6q_7q_8 -$
 $2304q_0q_3q_{19} - 2304q_0q_4q_{18} - 1152q_0q_{10}q_{12} - 3456q_1q_2q_{19} - 4608q_1q_3q_{18} - 3456q_1q_4q_{17} - 2304q_1q_{10}q_{11} -$
 $3456q_2q_3q_{17} - 3456q_2q_4q_{16} - 2304q_3q_4q_{15} - 2304q_5q_6q_{11} - 1152q_5q_7q_{10} - 6912q_5q_8q_9 - 3456q_6q_7q_9 -$
 $2304q_0q_4q_{19} - 1152q_0q_{10}q_{13} - 2304q_0q_{11}q_{12} - 4608q_1q_3q_{19} - 3456q_1q_4q_{18} - 1152q_1q_{10}q_{12} - 4608q_2q_3q_{18} -$
 $4608q_2q_4q_{17} - 2304q_2q_{10}q_{11} - 3456q_3q_4q_{16} - 2304q_5q_6q_{12} - 1152q_5q_7q_{11} - 1152q_5q_8q_{10} - 2304q_6q_7q_{10} -$
 $6912q_6q_8q_9 - 1152q_0q_{10}q_{14} - 2304q_0q_{11}q_{13} - 4608q_1q_4q_{19} - 2304q_1q_{10}q_{13} - 4608q_1q_{11}q_{12} - 3456q_2q_3q_{19} -$
 $3456q_2q_4q_{18} - 2304q_2q_{10}q_{12} - 4608q_3q_4q_{17} - 2304q_3q_{10}q_{11} - 2304q_5q_6q_{13} - 2304q_5q_7q_{12} - 2304q_5q_8q_{11} -$
 $1152q_5q_9q_{10} - 4608q_6q_7q_{11} - 2304q_6q_8q_{10} - 6912q_7q_8q_9 - 2304q_0q_{11}q_{14} - 2304q_0q_{12}q_{13} - 2304q_1q_{10}q_{14} -$
 $3456q_1q_{11}q_{13} - 4608q_2q_4q_{19} - 2304q_2q_{10}q_{13} - 4608q_2q_{11}q_{12} - 4608q_3q_4q_{18} - 2304q_3q_{10}q_{12} - 1152q_4q_{10}q_{11} -$
 $1152q_5q_6q_{14} - 2304q_5q_7q_{13} - 2304q_5q_8q_{12} - 2304q_5q_9q_{11} - 4608q_6q_7q_{12} - 3456q_6q_8q_{11} - 2304q_6q_9q_{10} -$
 $2304q_7q_8q_{10} - 2304q_0q_{12}q_{14} - 4608q_1q_{11}q_{14} - 4608q_1q_{12}q_{13} - 1152q_2q_{10}q_{14} - 3456q_2q_{11}q_{13} - 3456q_3q_4q_{19} -$
 $1152q_3q_{10}q_{13} - 3456q_3q_{11}q_{12} - 2304q_4q_{10}q_{12} - 1152q_5q_6q_{15} - 2304q_5q_7q_{14} - 1152q_5q_8q_{13} - 1152q_5q_9q_{12} -$
 $1152q_5q_{10}q_{11} - 3456q_6q_7q_{13} - 3456q_6q_8q_{12} - 4608q_6q_9q_{11} - 4608q_7q_8q_{11} - 2304q_7q_9q_{10} - 2304q_0q_{13}q_{14} -$
 $3456q_1q_{12}q_{14} - 3456q_2q_{11}q_{14} - 3456q_2q_{12}q_{13} - 2304q_3q_{10}q_{14} - 4608q_3q_{11}q_{13} - 2304q_4q_{10}q_{13} - 3456q_4q_{11}q_{12} -$
 $2304q_5q_6q_{16} - 1152q_5q_7q_{15} - 2304q_5q_8q_{14} - 2304q_5q_9q_{13} - 1152q_5q_{10}q_{12} - 3456q_6q_7q_{14} - 4608q_6q_8q_{13} -$
 $3456q_6q_9q_{12} - 2304q_6q_{10}q_{11} - 3456q_7q_8q_{12} - 3456q_7q_9q_{11} - 2304q_8q_9q_{10} - 3456q_1q_{13}q_{14} - 4608q_2q_{12}q_{14} -$
 $3456q_3q_{11}q_{14} - 4608q_3q_{12}q_{13} - 2304q_4q_{10}q_{14} - 4608q_4q_{11}q_{13} - 2304q_5q_6q_{17} - 1152q_5q_7q_{16} - 1152q_5q_8q_{15} -$
 $2304q_5q_9q_{14} - 1152q_5q_{10}q_{13} - 2304q_5q_{11}q_{12} - 2304q_6q_7q_{15} - 4608q_6q_8q_{14} - 3456q_6q_9q_{13} - 1152q_6q_{10}q_{12} -$
 $4608q_7q_8q_{13} - 4608q_7q_9q_{12} - 2304q_7q_{10}q_{11} - 3456q_8q_9q_{11} - 4608q_2q_{13}q_{14} - 3456q_3q_{12}q_{14} - 4608q_4q_{11}q_{14} -$
 $3456q_4q_{12}q_{13} - 2304q_5q_6q_{18} - 2304q_5q_7q_{17} - 2304q_5q_8q_{16} - 1152q_5q_9q_{15} - 1152q_5q_{10}q_{14} - 2304q_5q_{11}q_{13} -$
 $4608q_6q_7q_{16} - 2304q_6q_8q_{15} - 4608q_6q_9q_{14} - 2304q_6q_{10}q_{13} - 4608q_6q_{11}q_{12} - 3456q_7q_8q_{14} - 3456q_7q_9q_{13} -$
 $2304q_7q_{10}q_{12} - 4608q_8q_9q_{12} - 2304q_8q_{10}q_{11} - 4608q_3q_{13}q_{14} - 4608q_4q_{12}q_{14} - 1152q_5q_6q_{19} - 2304q_5q_7q_{18} -$
 $2304q_5q_8q_{17} - 2304q_5q_9q_{16} - 2304q_5q_{11}q_{14} - 2304q_5q_{12}q_{13} - 4608q_6q_7q_{17} - 3456q_6q_8q_{16} - 2304q_6q_9q_{15} -$
 $2304q_6q_{10}q_{14} - 3456q_6q_{11}q_{13} - 2304q_7q_8q_{15} - 4608q_7q_9q_{14} - 2304q_7q_{10}q_{13} - 4608q_7q_{11}q_{12} - 4608q_8q_9q_{13} -$
 $2304q_8q_{10}q_{12} - 1152q_9q_{10}q_{11} - 1152q_0q_{15}q_{16} - 3456q_4q_{13}q_{14} - 2304q_5q_7q_{19} - 1152q_5q_8q_{18} - 1152q_5q_9q_{17} -$
 $2304q_5q_{12}q_{14} - 3456q_6q_7q_{18} - 3456q_6q_8q_{17} - 4608q_6q_9q_{16} - 4608q_6q_{11}q_{14} - 4608q_6q_{12}q_{13} - 4608q_7q_8q_{16} -$
 $2304q_7q_9q_{15} - 1152q_7q_{10}q_{14} - 3456q_7q_{11}q_{13} - 3456q_8q_9q_{14} - 1152q_8q_{10}q_{13} - 3456q_8q_{11}q_{12} - 2304q_9q_{10}q_{12} -$
 $1152q_0q_{15}q_{17} - 2304q_1q_{15}q_{16} - 2304q_5q_8q_{19} - 2304q_5q_9q_{18} - 2304q_5q_{13}q_{14} - 3456q_6q_7q_{19} - 4608q_6q_8q_{18} -$

$$\begin{aligned}
& 3456q_6q_9q_{17} - 3456q_6q_{12}q_{14} - 3456q_7q_8q_{17} - 3456q_7q_9q_{16} - 3456q_7q_{11}q_{14} - 3456q_7q_{12}q_{13} - 2304q_8q_9q_{15} - \\
& 2304q_8q_{10}q_{14} - 4608q_8q_{11}q_{13} - 2304q_9q_{10}q_{13} - 3456q_9q_{11}q_{12} - 1152q_0q_{15}q_{18} - 2304q_0q_{16}q_{17} - 1152q_1q_{15}q_{17} - \\
& 2304q_2q_{15}q_{16} - 2304q_5q_9q_{19} - 4608q_6q_8q_{19} - 3456q_6q_9q_{18} - 3456q_6q_{13}q_{14} - 4608q_7q_8q_{18} - 4608q_7q_9q_{17} - \\
& 4608q_7q_{12}q_{14} - 3456q_8q_9q_{16} - 3456q_8q_{11}q_{14} - 4608q_8q_{12}q_{13} - 2304q_9q_{10}q_{14} - 4608q_9q_{11}q_{13} - 3456q_{10}q_{11}q_{12} - \\
& 1152q_0q_{15}q_{19} - 2304q_0q_{16}q_{18} - 2304q_1q_{15}q_{18} - 4608q_1q_{16}q_{17} - 2304q_2q_{15}q_{17} - 2304q_3q_{15}q_{16} - 4608q_6q_9q_{19} - \\
& 3456q_7q_8q_{19} - 3456q_7q_9q_{18} - 4608q_7q_{13}q_{14} - 4608q_8q_9q_{17} - 3456q_8q_{12}q_{14} - 4608q_9q_{11}q_{14} - 3456q_9q_{12}q_{13} - \\
& 6912q_{10}q_{11}q_{13} - 2304q_0q_{16}q_{19} - 2304q_0q_{17}q_{18} - 2304q_1q_{15}q_{19} - 3456q_1q_{16}q_{18} - 2304q_2q_{15}q_{18} - 4608q_2q_{16}q_{17} - \\
& 2304q_3q_{15}q_{17} - 1152q_4q_{15}q_{16} - 4608q_7q_9q_{19} - 4608q_8q_9q_{18} - 4608q_8q_{13}q_{14} - 4608q_9q_{12}q_{14} - 3456q_{10}q_{11}q_{14} - \\
& 6912q_{10}q_{12}q_{13} - 2304q_0q_{17}q_{19} - 4608q_1q_{16}q_{19} - 4608q_1q_{17}q_{18} - 1152q_2q_{15}q_{19} - 3456q_2q_{16}q_{18} - 1152q_3q_{15}q_{18} - \\
& 3456q_3q_{16}q_{17} - 2304q_4q_{15}q_{17} - 1152q_5q_{15}q_{16} - 3456q_8q_9q_{19} - 3456q_9q_{13}q_{14} - 1152q_{10}q_{11}q_{15} - 3456q_{10}q_{12}q_{14} - \\
& 6912q_{11}q_{12}q_{13} - 2304q_0q_{18}q_{19} - 3456q_1q_{17}q_{19} - 3456q_2q_{16}q_{19} - 3456q_2q_{17}q_{18} - 2304q_3q_{15}q_{19} - 4608q_3q_{16}q_{18} - \\
& 2304q_4q_{15}q_{18} - 3456q_4q_{16}q_{17} - 1152q_5q_{15}q_{17} - 2304q_6q_{15}q_{16} - 2304q_{10}q_{11}q_{16} - 1152q_{10}q_{12}q_{15} - \\
& 6912q_{10}q_{13}q_{14} - 3456q_{11}q_{12}q_{14} - 3456q_{11}q_{18}q_{19} - 4608q_2q_{17}q_{19} - 3456q_3q_{16}q_{19} - 4608q_3q_{17}q_{18} - \\
& 2304q_4q_{15}q_{19} - 4608q_4q_{16}q_{18} - 1152q_5q_{15}q_{18} - 2304q_5q_{16}q_{17} - 1152q_6q_{15}q_{17} - 2304q_7q_{15}q_{16} - 2304q_{10}q_{11}q_{17} - \\
& 1152q_{10}q_{12}q_{16} - 1152q_{10}q_{13}q_{15} - 2304q_{11}q_{12}q_{15} - 6912q_{11}q_{13}q_{14} - 4608q_2q_{18}q_{19} - 3456q_3q_{17}q_{19} - \\
& 4608q_4q_{16}q_{19} - 3456q_4q_{17}q_{18} - 1152q_5q_{15}q_{19} - 2304q_5q_{16}q_{18} - 2304q_6q_{15}q_{18} - 4608q_6q_{16}q_{17} - 2304q_7q_{15}q_{17} - \\
& 2304q_8q_{15}q_{16} - 2304q_{10}q_{11}q_{18} - 2304q_{10}q_{12}q_{17} - 2304q_{10}q_{13}q_{16} - 1152q_{10}q_{14}q_{15} - 4608q_{11}q_{12}q_{16} - \\
& 2304q_{11}q_{13}q_{15} - 6912q_{12}q_{13}q_{14} - 4608q_3q_{18}q_{19} - 4608q_4q_{17}q_{19} - 2304q_5q_{16}q_{19} - 2304q_5q_{17}q_{18} - \\
& 2304q_6q_{15}q_{19} - 3456q_6q_{16}q_{18} - 2304q_7q_{15}q_{18} - 4608q_7q_{16}q_{17} - 2304q_8q_{15}q_{17} - 1152q_9q_{15}q_{16} - 1152q_{10}q_{11}q_{19} - \\
& 2304q_{10}q_{12}q_{18} - 2304q_{10}q_{13}q_{17} - 2304q_{10}q_{14}q_{16} - 4608q_{11}q_{12}q_{17} - 3456q_{11}q_{13}q_{16} - 2304q_{11}q_{14}q_{15} - \\
& 2304q_{12}q_{13}q_{15} - 3456q_4q_{18}q_{19} - 2304q_5q_{17}q_{19} - 4608q_6q_{16}q_{19} - 4608q_6q_{17}q_{18} - 1152q_7q_{15}q_{19} - 3456q_7q_{16}q_{18} - \\
& 1152q_8q_{15}q_{18} - 3456q_8q_{16}q_{17} - 2304q_9q_{15}q_{17} - 2304q_{10}q_{12}q_{19} - 1152q_{10}q_{13}q_{18} - 1152q_{10}q_{14}q_{17} - \\
& 1152q_{10}q_{15}q_{16} - 3456q_{11}q_{12}q_{18} - 3456q_{11}q_{13}q_{17} - 4608q_{11}q_{14}q_{16} - 4608q_{12}q_{13}q_{16} - 2304q_{12}q_{14}q_{15} - \\
& 2304q_5q_{18}q_{19} - 3456q_6q_{17}q_{19} - 3456q_7q_{16}q_{19} - 3456q_7q_{17}q_{18} - 2304q_8q_{15}q_{19} - 4608q_8q_{16}q_{18} - 2304q_9q_{15}q_{18} - \\
& 3456q_9q_{16}q_{17} - 2304q_{10}q_{13}q_{19} - 2304q_{10}q_{14}q_{18} - 1152q_{10}q_{15}q_{17} - 3456q_{11}q_{12}q_{19} - 4608q_{11}q_{13}q_{18} - \\
& 3456q_{11}q_{14}q_{17} - 2304q_{11}q_{15}q_{16} - 3456q_{12}q_{13}q_{17} - 3456q_{12}q_{14}q_{16} - 2304q_{13}q_{14}q_{15} - 3456q_6q_{18}q_{19} - \\
& 4608q_7q_{17}q_{19} - 3456q_8q_{16}q_{19} - 4608q_8q_{17}q_{18} - 2304q_9q_{15}q_{19} - 4608q_9q_{16}q_{18} - 2304q_{10}q_{14}q_{19} - 1152q_{10}q_{15}q_{18} - \\
& 2304q_{10}q_{16}q_{17} - 4608q_{11}q_{13}q_{19} - 3456q_{11}q_{14}q_{18} - 1152q_{11}q_{15}q_{17} - 4608q_{12}q_{13}q_{18} - 4608q_{12}q_{14}q_{17} - \\
& 2304q_{12}q_{15}q_{16} - 3456q_{13}q_{14}q_{16} - 4608q_7q_{18}q_{19} - 3456q_8q_{17}q_{19} - 4608q_9q_{16}q_{19} - 3456q_9q_{17}q_{18} - \\
& 1152q_{10}q_{15}q_{19} - 2304q_{10}q_{16}q_{18} - 4608q_{11}q_{14}q_{19} - 2304q_{11}q_{15}q_{18} - 4608q_{11}q_{16}q_{17} - 3456q_{12}q_{13}q_{19} - \\
& 3456q_{12}q_{14}q_{18} - 2304q_{12}q_{15}q_{17} - 4608q_{13}q_{14}q_{17} - 2304q_{13}q_{15}q_{16} - 4608q_8q_{18}q_{19} - 4608q_9q_{17}q_{19} - \\
& 2304q_{10}q_{16}q_{19} - 2304q_{10}q_{17}q_{18} - 2304q_{11}q_{15}q_{19} - 3456q_{11}q_{16}q_{18} - 4608q_{12}q_{14}q_{19} - 2304q_{12}q_{15}q_{18} - \\
& 4608q_{12}q_{16}q_{17} - 4608q_{13}q_{14}q_{18} - 2304q_{13}q_{15}q_{17} - 1152q_{14}q_{15}q_{16} - 3456q_9q_{18}q_{19} - 2304q_{10}q_{17}q_{19} - \\
& 4608q_{11}q_{16}q_{19} - 4608q_{11}q_{17}q_{18} - 1152q_{12}q_{15}q_{19} - 3456q_{12}q_{16}q_{18} - 3456q_{13}q_{14}q_{19} - 1152q_{13}q_{15}q_{18} - \\
& 3456q_{13}q_{16}q_{17} - 2304q_{14}q_{15}q_{17} - 2304q_{10}q_{18}q_{19} - 3456q_{11}q_{17}q_{19} - 3456q_{12}q_{16}q_{19} - 3456q_{12}q_{17}q_{18} - \\
& 2304q_{13}q_{15}q_{19} - 4608q_{13}q_{16}q_{18} - 2304q_{14}q_{15}q_{18} - 3456q_{14}q_{16}q_{17} - 3456q_{11}q_{18}q_{19} - 4608q_{12}q_{17}q_{19} - \\
& 3456q_{13}q_{16}q_{19} - 4608q_{13}q_{17}q_{18} - 2304q_{14}q_{15}q_{19} - 4608q_{14}q_{16}q_{18} - 3456q_{15}q_{16}q_{17} - 4608q_{12}q_{18}q_{19} - \\
& 3456q_{13}q_{17}q_{19} - 4608q_{14}q_{16}q_{19} - 3456q_{14}q_{17}q_{18} - 6912q_{15}q_{16}q_{18} - 4608q_{13}q_{18}q_{19} - 4608q_{14}q_{17}q_{19} - \\
& 3456q_{15}q_{16}q_{19} - 6912q_{15}q_{17}q_{18} - 3456q_{14}q_{18}q_{19} - 3456q_{15}q_{17}q_{19} - 6912q_{16}q_{17}q_{18} - 6912q_{15}q_{18}q_{19} - \\
& 3456q_{16}q_{17}q_{19} - 6912q_{16}q_{18}q_{19} - 6912q_{17}q_{18}q_{19} + 6912q_0q_1q_2q_3 + 6912q_0q_1q_3q_4 + 6912q_0q_2q_3q_4 + \\
& 6912q_1q_2q_3q_4 + 2304q_0q_1q_5q_6 + 2304q_0q_1q_6q_7 + 2304q_0q_2q_5q_7 + 2304q_1q_2q_5q_6 + 2304q_0q_1q_7q_8 + \\
& 2304q_0q_2q_6q_8 + 2304q_0q_3q_5q_8 + 2304q_0q_3q_6q_7 + 2304q_1q_2q_5q_8 + 4608q_1q_2q_6q_7 + 2304q_1q_3q_5q_7 + \\
& 2304q_2q_3q_5q_6 + 2304q_0q_1q_8q_9 + 2304q_0q_2q_7q_9 + 2304q_0q_3q_6q_9 + 2304q_0q_4q_5q_9 + 2304q_0q_4q_6q_8 + \\
& 2304q_1q_2q_6q_9 + 2304q_1q_2q_7q_8 + 2304q_1q_3q_5q_9 + 4608q_1q_3q_6q_8 + 2304q_1q_4q_5q_8 + 2304q_1q_4q_6q_7 + \\
& 2304q_2q_3q_6q_7 + 2304q_2q_4q_5q_7 + 2304q_3q_4q_5q_6 + 2304q_0q_2q_8q_9 + 2304q_0q_3q_7q_9 + 2304q_0q_4q_6q_9 + \\
& 2304q_0q_4q_7q_8 + 2304q_1q_2q_7q_9 + 2304q_1q_3q_6q_9 + 2304q_1q_3q_7q_8 + 2304q_1q_4q_5q_9 + 2304q_1q_4q_6q_8 + \\
& 2304q_2q_3q_5q_9 + 2304q_2q_3q_6q_8 + 2304q_2q_4q_5q_8 + 2304q_2q_4q_6q_7 + 2304q_3q_4q_5q_7 + 2304q_1q_2q_8q_9 + \\
& 2304q_1q_3q_7q_9 + 4608q_1q_4q_6q_9 + 2304q_1q_4q_7q_8 + 2304q_2q_3q_6q_9 + 4608q_2q_3q_7q_8 + 2304q_2q_4q_6q_8 +
\end{aligned}$$

$$\begin{aligned}
& 2304q_3q_4q_6q_7 + 2304q_1q_3q_8q_9 + 2304q_1q_4q_7q_9 + 2304q_2q_4q_6q_9 + 2304q_3q_4q_6q_8 + 2304q_0q_1q_{10}q_{11} + \\
& 2304q_2q_3q_8q_9 + 4608q_2q_4q_7q_9 + 2304q_3q_4q_7q_8 + 2304q_2q_4q_8q_9 + 2304q_3q_4q_7q_9 + 2304q_0q_1q_{11}q_{12} + \\
& 2304q_0q_2q_{10}q_{12} + 2304q_1q_2q_{10}q_{11} + 4608q_3q_4q_8q_9 + 2304q_0q_1q_{12}q_{13} + 2304q_0q_2q_{11}q_{13} + 2304q_0q_3q_{10}q_{13} + \\
& 2304q_0q_3q_{11}q_{12} + 2304q_1q_2q_{10}q_{13} + 4608q_1q_2q_{11}q_{12} + 2304q_1q_3q_{10}q_{12} + 2304q_2q_3q_{10}q_{11} + 6912q_5q_6q_7q_8 + \\
& 2304q_0q_1q_{13}q_{14} + 2304q_0q_2q_{12}q_{14} + 2304q_0q_3q_{11}q_{14} + 2304q_0q_4q_{10}q_{14} + 2304q_0q_4q_{11}q_{13} + 2304q_1q_2q_{11}q_{14} + \\
& 2304q_1q_2q_{12}q_{13} + 2304q_1q_3q_{10}q_{14} + 4608q_1q_3q_{11}q_{13} + 2304q_1q_4q_{10}q_{13} + 2304q_1q_4q_{11}q_{12} + 2304q_2q_3q_{11}q_{12} + \\
& 2304q_2q_4q_{10}q_{12} + 2304q_3q_4q_{10}q_{11} + 6912q_5q_6q_8q_9 + 2304q_0q_2q_{13}q_{14} + 2304q_0q_3q_{12}q_{14} + 2304q_0q_4q_{11}q_{14} + \\
& 2304q_0q_4q_{12}q_{13} + 2304q_1q_2q_{12}q_{14} + 2304q_1q_3q_{11}q_{14} + 2304q_1q_3q_{12}q_{13} + 2304q_1q_4q_{10}q_{14} + 2304q_1q_4q_{11}q_{13} + \\
& 2304q_2q_3q_{10}q_{14} + 2304q_2q_3q_{11}q_{13} + 2304q_2q_4q_{10}q_{13} + 2304q_2q_4q_{11}q_{12} + 2304q_3q_4q_{10}q_{12} + 6912q_5q_7q_8q_9 + \\
& 2304q_1q_2q_{13}q_{14} + 2304q_1q_3q_{12}q_{14} + 4608q_1q_4q_{11}q_{14} + 2304q_1q_4q_{12}q_{13} + 2304q_2q_3q_{11}q_{14} + 4608q_2q_3q_{12}q_{13} + \\
& 2304q_2q_4q_{11}q_{13} + 2304q_3q_4q_{11}q_{12} + 6912q_6q_7q_8q_9 + 2304q_1q_3q_{13}q_{14} + 2304q_1q_4q_{12}q_{14} + 2304q_2q_4q_{11}q_{14} + \\
& 2304q_3q_4q_{11}q_{13} + 2304q_0q_1q_{15}q_{16} + 2304q_2q_3q_{13}q_{14} + 4608q_2q_4q_{12}q_{14} + 2304q_3q_4q_{12}q_{13} + 2304q_5q_6q_{10}q_{11} + \\
& 2304q_2q_4q_{13}q_{14} + 2304q_3q_4q_{12}q_{14} + 2304q_0q_1q_{16}q_{17} + 2304q_0q_2q_{15}q_{17} + 2304q_1q_2q_{15}q_{16} + 4608q_3q_4q_{13}q_{14} + \\
& 2304q_5q_6q_{11}q_{12} + 2304q_5q_7q_{10}q_{12} + 2304q_6q_7q_{10}q_{11} + 2304q_0q_1q_{17}q_{18} + 2304q_0q_2q_{16}q_{18} + 2304q_0q_3q_{15}q_{18} + \\
& 2304q_0q_3q_{16}q_{17} + 2304q_1q_2q_{15}q_{18} + 4608q_1q_2q_{16}q_{17} + 2304q_1q_3q_{15}q_{17} + 2304q_2q_3q_{15}q_{16} + 2304q_5q_6q_{12}q_{13} + \\
& 2304q_5q_7q_{11}q_{13} + 2304q_5q_8q_{10}q_{13} + 2304q_5q_8q_{11}q_{12} + 2304q_6q_7q_{10}q_{13} + 4608q_6q_7q_{11}q_{12} + 2304q_6q_8q_{10}q_{12} + \\
& 2304q_7q_8q_{10}q_{11} + 2304q_0q_1q_{18}q_{19} + 2304q_0q_2q_{17}q_{19} + 2304q_0q_3q_{16}q_{19} + 2304q_0q_4q_{15}q_{19} + 2304q_0q_4q_{16}q_{18} + \\
& 2304q_1q_2q_{16}q_{19} + 2304q_1q_2q_{17}q_{18} + 2304q_1q_3q_{15}q_{19} + 4608q_1q_3q_{16}q_{18} + 2304q_1q_4q_{15}q_{18} + 2304q_1q_4q_{16}q_{17} + \\
& 2304q_2q_3q_{16}q_{17} + 2304q_2q_4q_{15}q_{17} + 2304q_3q_4q_{15}q_{16} + 2304q_5q_6q_{13}q_{14} + 2304q_5q_7q_{12}q_{14} + 2304q_5q_8q_{11}q_{14} + \\
& 2304q_5q_9q_{10}q_{14} + 2304q_5q_9q_{11}q_{13} + 2304q_6q_7q_{11}q_{14} + 2304q_6q_7q_{12}q_{13} + 2304q_6q_8q_{10}q_{14} + 4608q_6q_8q_{11}q_{13} + \\
& 2304q_6q_9q_{10}q_{13} + 2304q_6q_9q_{11}q_{12} + 2304q_7q_8q_{11}q_{12} + 2304q_7q_9q_{10}q_{12} + 2304q_8q_9q_{10}q_{11} + 2304q_0q_2q_{18}q_{19} + \\
& 2304q_0q_3q_{17}q_{19} + 2304q_0q_4q_{16}q_{19} + 2304q_0q_4q_{17}q_{18} + 2304q_1q_2q_{17}q_{19} + 2304q_1q_3q_{16}q_{19} + 2304q_1q_3q_{17}q_{18} + \\
& 2304q_1q_4q_{15}q_{19} + 2304q_1q_4q_{16}q_{18} + 2304q_2q_3q_{15}q_{19} + 2304q_2q_3q_{16}q_{18} + 2304q_2q_4q_{15}q_{18} + 2304q_2q_4q_{16}q_{17} + \\
& 2304q_3q_4q_{15}q_{17} + 2304q_5q_7q_{13}q_{14} + 2304q_5q_8q_{12}q_{14} + 2304q_5q_9q_{11}q_{14} + 2304q_5q_9q_{12}q_{13} + 2304q_6q_7q_{12}q_{14} + \\
& 2304q_6q_8q_{11}q_{14} + 2304q_6q_8q_{12}q_{13} + 2304q_6q_9q_{10}q_{14} + 2304q_6q_9q_{11}q_{13} + 2304q_7q_8q_{10}q_{14} + 2304q_7q_8q_{11}q_{13} + \\
& 2304q_7q_9q_{10}q_{13} + 2304q_7q_9q_{11}q_{12} + 2304q_8q_9q_{10}q_{12} + 2304q_1q_2q_{18}q_{19} + 2304q_1q_3q_{17}q_{19} + 4608q_1q_4q_{16}q_{19} + \\
& 2304q_1q_4q_{17}q_{18} + 2304q_2q_3q_{16}q_{19} + 4608q_2q_3q_{17}q_{18} + 2304q_2q_4q_{16}q_{18} + 2304q_3q_4q_{16}q_{17} + 2304q_6q_7q_{13}q_{14} + \\
& 2304q_6q_8q_{12}q_{14} + 4608q_6q_9q_{11}q_{14} + 2304q_6q_9q_{12}q_{13} + 2304q_7q_8q_{11}q_{14} + 4608q_7q_8q_{12}q_{13} + 2304q_7q_9q_{11}q_{13} + \\
& 2304q_8q_9q_{11}q_{12} + 2304q_1q_3q_{18}q_{19} + 2304q_1q_4q_{17}q_{19} + 2304q_2q_4q_{16}q_{19} + 2304q_3q_4q_{16}q_{18} + 2304q_6q_8q_{13}q_{14} + \\
& 2304q_6q_9q_{12}q_{14} + 2304q_7q_9q_{11}q_{14} + 2304q_8q_9q_{11}q_{13} + 2304q_2q_3q_{18}q_{19} + 4608q_2q_4q_{17}q_{19} + 2304q_3q_4q_{17}q_{18} + \\
& 2304q_5q_6q_{15}q_{16} + 2304q_7q_8q_{13}q_{14} + 4608q_7q_9q_{12}q_{14} + 2304q_8q_9q_{12}q_{13} + 2304q_2q_4q_{18}q_{19} + 2304q_3q_4q_{17}q_{19} + \\
& 2304q_7q_9q_{13}q_{14} + 2304q_8q_9q_{12}q_{14} + 4608q_3q_4q_{18}q_{19} + 2304q_5q_6q_{16}q_{17} + 2304q_5q_7q_{15}q_{17} + 2304q_6q_7q_{15}q_{16} + \\
& 4608q_8q_9q_{13}q_{14} + 2304q_5q_6q_{17}q_{18} + 2304q_5q_7q_{16}q_{18} + 2304q_5q_8q_{15}q_{18} + 2304q_5q_8q_{16}q_{17} + 2304q_6q_7q_{15}q_{18} + \\
& 4608q_6q_7q_{16}q_{17} + 2304q_6q_8q_{15}q_{17} + 2304q_7q_8q_{15}q_{16} + 6912q_{10}q_{11}q_{12}q_{13} + 2304q_5q_6q_{18}q_{19} + 2304q_5q_7q_{17}q_{19} + \\
& 2304q_5q_8q_{16}q_{19} + 2304q_5q_9q_{15}q_{19} + 2304q_5q_9q_{16}q_{18} + 2304q_6q_7q_{16}q_{19} + 2304q_6q_7q_{17}q_{18} + 2304q_6q_8q_{15}q_{19} + \\
& 4608q_6q_8q_{16}q_{18} + 2304q_6q_9q_{15}q_{18} + 2304q_6q_9q_{16}q_{17} + 2304q_7q_8q_{16}q_{17} + 2304q_7q_9q_{15}q_{17} + 2304q_8q_9q_{15}q_{16} + \\
& 6912q_{10}q_{11}q_{13}q_{14} + 2304q_5q_7q_{18}q_{19} + 2304q_5q_8q_{17}q_{19} + 2304q_5q_9q_{16}q_{19} + 2304q_5q_9q_{17}q_{18} + 2304q_6q_7q_{17}q_{19} + \\
& 2304q_6q_8q_{16}q_{19} + 2304q_6q_8q_{17}q_{18} + 2304q_6q_9q_{15}q_{19} + 2304q_6q_9q_{16}q_{18} + 2304q_7q_8q_{15}q_{19} + 2304q_7q_8q_{16}q_{18} + \\
& 2304q_7q_9q_{15}q_{18} + 2304q_7q_9q_{16}q_{17} + 2304q_8q_9q_{15}q_{17} + 6912q_{10}q_{12}q_{13}q_{14} + 2304q_6q_7q_{18}q_{19} + 2304q_6q_8q_{17}q_{19} + \\
& 4608q_6q_9q_{16}q_{19} + 2304q_6q_9q_{17}q_{18} + 2304q_7q_8q_{16}q_{19} + 4608q_7q_8q_{17}q_{18} + 2304q_7q_9q_{16}q_{18} + 2304q_8q_9q_{16}q_{17} + \\
& 6912q_{11}q_{12}q_{13}q_{14} + 2304q_6q_8q_{18}q_{19} + 2304q_6q_9q_{17}q_{19} + 2304q_7q_9q_{16}q_{19} + 2304q_8q_9q_{16}q_{18} + 2304q_7q_8q_{18}q_{19} + \\
& 4608q_7q_9q_{17}q_{19} + 2304q_8q_9q_{17}q_{18} + 2304q_{10}q_{11}q_{15}q_{16} + 2304q_7q_9q_{18}q_{19} + 2304q_8q_9q_{17}q_{19} + 4608q_8q_9q_{18}q_{19} + \\
& 2304q_{10}q_{11}q_{16}q_{17} + 2304q_{10}q_{12}q_{15}q_{17} + 2304q_{11}q_{12}q_{15}q_{16} + 2304q_{10}q_{11}q_{17}q_{18} + 2304q_{10}q_{12}q_{16}q_{18} + \\
& 2304q_{10}q_{13}q_{15}q_{18} + 2304q_{10}q_{13}q_{16}q_{17} + 2304q_{11}q_{12}q_{15}q_{18} + 4608q_{11}q_{12}q_{16}q_{17} + 2304q_{11}q_{13}q_{15}q_{17} + \\
& 2304q_{12}q_{13}q_{15}q_{16} + 2304q_{10}q_{11}q_{18}q_{19} + 2304q_{10}q_{12}q_{17}q_{19} + 2304q_{10}q_{13}q_{16}q_{19} + 2304q_{10}q_{14}q_{15}q_{19} + \\
& 2304q_{10}q_{14}q_{16}q_{18} + 2304q_{11}q_{12}q_{16}q_{19} + 2304q_{11}q_{12}q_{17}q_{18} + 2304q_{11}q_{13}q_{15}q_{19} + 4608q_{11}q_{13}q_{16}q_{18} + \\
& 2304q_{11}q_{14}q_{15}q_{18} + 2304q_{11}q_{14}q_{16}q_{17} + 2304q_{12}q_{13}q_{16}q_{17} + 2304q_{12}q_{14}q_{15}q_{17} + 2304q_{13}q_{14}q_{15}q_{16} + \\
& 2304q_{10}q_{12}q_{18}q_{19} + 2304q_{10}q_{13}q_{17}q_{19} + 2304q_{10}q_{14}q_{16}q_{19} + 2304q_{10}q_{14}q_{17}q_{18} + 2304q_{11}q_{12}q_{17}q_{19} +
\end{aligned}$$

$$\begin{aligned}
& 2304q_{11}q_{13}q_{16}q_{19} + 2304q_{11}q_{13}q_{17}q_{18} + 2304q_{11}q_{14}q_{15}q_{19} + 2304q_{11}q_{14}q_{16}q_{18} + 2304q_{12}q_{13}q_{15}q_{19} + \\
& 2304q_{12}q_{13}q_{16}q_{18} + 2304q_{12}q_{14}q_{15}q_{18} + 2304q_{12}q_{14}q_{16}q_{17} + 2304q_{13}q_{14}q_{15}q_{17} + 2304q_{11}q_{12}q_{18}q_{19} + \\
& 2304q_{11}q_{13}q_{17}q_{19} + 4608q_{11}q_{14}q_{16}q_{19} + 2304q_{11}q_{14}q_{17}q_{18} + 2304q_{12}q_{13}q_{16}q_{19} + 4608q_{12}q_{13}q_{17}q_{18} + \\
& 2304q_{12}q_{14}q_{16}q_{18} + 2304q_{13}q_{14}q_{16}q_{17} + 2304q_{11}q_{13}q_{18}q_{19} + 2304q_{11}q_{14}q_{17}q_{19} + 2304q_{12}q_{14}q_{16}q_{19} + \\
& 2304q_{13}q_{14}q_{16}q_{18} + 2304q_{12}q_{13}q_{18}q_{19} + 4608q_{12}q_{14}q_{17}q_{19} + 2304q_{13}q_{14}q_{17}q_{18} + 2304q_{12}q_{14}q_{18}q_{19} + \\
& 2304q_{13}q_{14}q_{17}q_{19} + 4608q_{13}q_{14}q_{18}q_{19} + 6912q_{15}q_{16}q_{17}q_{18} + 6912q_{15}q_{16}q_{18}q_{19} + 6912q_{15}q_{17}q_{18}q_{19} + \\
& 6912q_{16}q_{17}q_{18}q_{19} + 93312
\end{aligned}$$

A complete expression of $E_2(q)$ for 36-order Williamson based method or 108-order Baumert-Hall based method by taking $\delta = 10, 545, 408$

$$\begin{aligned}
E_2(q) = & 31648320q_{20} - 32544q_1 - 32544q_2 - 32544q_3 - 32544q_4 - 19584q_5 - 32544q_6 - 32544q_7 - \\
& 32544q_8 - 32544q_9 - 19584q_{10} - 32544q_{11} - 32544q_{12} - 32544q_{13} - 32544q_{14} - 19584q_{15} - 32544q_{16} - \\
& 32544q_{17} - 32544q_{18} - 32544q_{19} - 19584q_0 + 31648320q_{21} + 31649472q_{22} + 31648320q_{23} + 31656960q_{24} + \\
& 31658112q_{25} + 31656960q_{26} + 31658112q_{27} + 31656960q_{28} + 31658112q_{29} + 31648320q_{30} + 31648320q_{31} + \\
& 31649472q_{32} + 31648320q_{33} + 31656960q_{34} + 31658112q_{35} + 31656960q_{36} + 31658112q_{37} + 31656960q_{38} + \\
& 31658112q_{39} + 31648320q_{40} + 31648320q_{41} + 31649472q_{42} + 31648320q_{43} + 31656960q_{44} + 31658112q_{45} + \\
& 31656960q_{46} + 31658112q_{47} + 31656960q_{48} + 31658112q_{49} + 31648320q_{50} + 31648320q_{51} + 31649472q_{52} + \\
& 31648320q_{53} + 31656960q_{54} + 31658112q_{55} + 31656960q_{56} + 31658112q_{57} + 31656960q_{58} + 31658112q_{59} + \\
& 10545408q_0q_1 + 10545408q_0q_2 + 10545408q_0q_3 + 10545408q_1q_2 + 10545408q_0q_4 + 10545408q_1q_3 + \\
& 2304q_0q_5 + 10545408q_1q_4 + 10545408q_2q_3 + 4032q_0q_6 + 4032q_1q_5 + 10545408q_2q_4 + 4032q_0q_7 + 7488q_1q_6 + \\
& 4032q_2q_5 + 10545408q_3q_4 + 4032q_0q_8 + 6912q_1q_7 + 6912q_2q_6 + 4032q_3q_5 + 4032q_0q_9 + 6912q_1q_8 + 7488q_2q_7 + \\
& 6912q_3q_6 + 4032q_4q_5 + 2304q_0q_{10} + 6912q_1q_9 + 6912q_2q_8 + 6912q_3q_7 + 6912q_4q_6 + 4032q_0q_{11} + 4032q_1q_{10} + \\
& 6912q_2q_9 + 7488q_3q_8 + 6912q_4q_7 + 10545408q_5q_6 + 4032q_0q_{12} + 7488q_1q_{11} + 4032q_2q_{10} + 6912q_3q_9 + \\
& 6912q_4q_8 + 10545408q_5q_7 + 4032q_0q_{13} + 6912q_1q_{12} + 6912q_2q_{11} + 4032q_3q_{10} + 7488q_4q_9 + 10545408q_5q_8 + \\
& 10545408q_6q_7 + 4032q_0q_{14} + 6912q_1q_{13} + 7488q_2q_{12} + 6912q_3q_{11} + 4032q_4q_{10} + 10545408q_5q_9 + \\
& 10545408q_6q_8 + 2304q_0q_{15} + 6912q_1q_{14} + 6912q_2q_{13} + 6912q_3q_{12} + 6912q_4q_{11} + 2304q_5q_{10} + 10545408q_6q_9 + \\
& 10545408q_7q_8 + 4032q_0q_{16} + 4032q_1q_{15} + 6912q_2q_{14} + 7488q_3q_{13} + 6912q_4q_{12} + 4032q_5q_{11} + 4032q_6q_{10} + \\
& 10545408q_7q_9 + 4032q_0q_{17} + 7488q_1q_{16} + 4032q_2q_{15} + 6912q_3q_{14} + 6912q_4q_{13} + 4032q_5q_{12} + 7488q_6q_{11} + \\
& 4032q_7q_{10} + 10545408q_8q_9 + 4032q_0q_{18} + 6912q_1q_{17} + 6912q_2q_{16} + 4032q_3q_{15} + 7488q_4q_{14} + 4032q_5q_{13} + \\
& 6912q_6q_{12} + 6912q_7q_{11} + 4032q_8q_{10} + 4032q_0q_{19} + 6912q_1q_{18} + 7488q_2q_{17} + 6912q_3q_{16} + 4032q_4q_{15} + \\
& 4032q_5q_{14} + 6912q_6q_{13} + 7488q_7q_{12} + 6912q_8q_{11} + 4032q_9q_{10} - 21090816q_0q_{20} + 6912q_1q_{19} + 6912q_2q_{18} + \\
& 6912q_3q_{17} + 6912q_4q_{16} + 2304q_5q_{15} + 6912q_6q_{14} + 6912q_7q_{13} + 6912q_8q_{12} + 6912q_9q_{11} - 21090816q_0q_{21} - \\
& 21090816q_1q_{20} + 6912q_2q_{19} + 7488q_3q_{18} + 6912q_4q_{17} + 4032q_5q_{16} + 4032q_6q_{15} + 6912q_7q_{14} + 7488q_8q_{13} + \\
& 6912q_9q_{12} + 10545408q_{10}q_{11} - 21090816q_0q_{22} - 3456q_2q_{20} + 6912q_3q_{19} + 6912q_4q_{18} + 4032q_5q_{17} + \\
& 7488q_6q_{16} + 4032q_7q_{15} + 6912q_8q_{14} + 6912q_9q_{13} + 10545408q_{10}q_{12} - 21090816q_0q_{23} - 21090816q_2q_{21} - \\
& 6912q_3q_{20} + 7488q_4q_{19} + 4032q_5q_{18} + 6912q_6q_{17} + 6912q_7q_{16} + 4032q_8q_{15} + 7488q_9q_{14} + 10545408q_{10}q_{13} + \\
& 10545408q_{11}q_{12} - 6912q_3q_{21} - 3456q_4q_{20} + 4032q_5q_{19} + 6912q_6q_{18} + 7488q_7q_{17} + 6912q_8q_{16} + 4032q_9q_{15} + \\
& 10545408q_{10}q_{14} + 10545408q_{11}q_{13} - 21090816q_1q_{24} - 21090816q_3q_{22} - 3456q_4q_{21} - 1152q_5q_{20} + 6912q_6q_{19} + \\
& 6912q_7q_{18} + 6912q_8q_{17} + 6912q_9q_{16} + 2304q_{10}q_{15} + 10545408q_{11}q_{14} + 10545408q_{12}q_{13} - 21090816q_1q_{25} - \\
& 21090816q_2q_{24} - 6912q_4q_{22} - 1152q_5q_{21} - 2304q_6q_{20} + 6912q_7q_{19} + 7488q_8q_{18} + 6912q_9q_{17} + 4032q_{10}q_{16} + \\
& 4032q_{11}q_{15} + 10545408q_{12}q_{14} - 21090816q_1q_{26} - 6912q_3q_{24} - 21090816q_4q_{23} - 1152q_5q_{22} - 1152q_6q_{21} - \\
& 2304q_7q_{20} + 6912q_8q_{19} + 6912q_9q_{18} + 4032q_{10}q_{17} + 7488q_{11}q_{16} + 4032q_{12}q_{15} + 10545408q_{13}q_{14} - \\
& 21090816q_3q_{25} - 3456q_4q_{24} - 1152q_5q_{23} - 2304q_6q_{22} - 2304q_7q_{21} - 2304q_8q_{20} + 7488q_9q_{19} + 4032q_{10}q_{18} + \\
& 6912q_{11}q_{17} + 6912q_{12}q_{16} + 4032q_{13}q_{15} - 21090816q_2q_{27} - 6912q_4q_{25} - 2304q_5q_{24} - 2304q_6q_{23} - 2304q_7q_{22} - \\
& 2304q_8q_{21} - 1152q_9q_{20} + 4032q_{10}q_{19} + 6912q_{11}q_{18} + 7488q_{12}q_{17} + 6912q_{13}q_{16} + 4032q_{14}q_{15} - 1152q_0q_{30} - \\
& 21090816q_2q_{28} - 21090816q_3q_{27} - 21090816q_4q_{26} - 2304q_5q_{25} - 4608q_6q_{24} - 1152q_7q_{23} - 1152q_8q_{22} - \\
& 2304q_9q_{21} - 1152q_{10}q_{20} + 6912q_{11}q_{19} + 6912q_{12}q_{18} + 6912q_{13}q_{17} + 6912q_{14}q_{16} - 1152q_0q_{31} - 2304q_1q_{30} - \\
& 6912q_4q_{27} - 2304q_5q_{26} - 3456q_6q_{25} - 4608q_7q_{24} - 2304q_8q_{23} - 2304q_9q_{22} - 1152q_{10}q_{21} - 2304q_{11}q_{20} +
\end{aligned}$$

$$\begin{aligned}
& 6912q_{12}q_{19} + 7488q_{13}q_{18} + 6912q_{14}q_{17} + 10545408q_{15}q_{16} - 1152q_0q_{32} - 1152q_1q_{31} - 2304q_2q_{30} - \\
& 21090816q_3q_{29} - 21090816q_4q_{28} - 2304q_5q_{27} - 4608q_6q_{26} - 3456q_7q_{25} - 3456q_8q_{24} - 2304q_9q_{23} - \\
& 1152q_{10}q_{22} - 1152q_{11}q_{21} - 2304q_{12}q_{20} + 6912q_{13}q_{19} + 6912q_{14}q_{18} + 10545408q_{15}q_{17} - 1152q_0q_{33} - \\
& 2304q_1q_{32} - 2304q_2q_{31} - 2304q_3q_{30} - 21090816q_4q_{29} - 2304q_5q_{28} - 4608q_6q_{27} - 3456q_7q_{26} - 4608q_8q_{25} - \\
& 3456q_9q_{24} - 1152q_{10}q_{23} - 2304q_{11}q_{22} - 2304q_{12}q_{21} - 2304q_{13}q_{20} + 7488q_{14}q_{19} + 10545408q_{15}q_{18} + \\
& 10545408q_{16}q_{17} - 2304q_0q_{34} - 2304q_1q_{33} - 2304q_2q_{32} - 2304q_3q_{31} - 1152q_4q_{30} - 2304q_5q_{29} - 3456q_6q_{28} - \\
& 3456q_7q_{27} - 3456q_8q_{26} - 4608q_9q_{25} - 2304q_{10}q_{24} - 2304q_{11}q_{23} - 2304q_{12}q_{22} - 2304q_{13}q_{21} - 1152q_{14}q_{20} + \\
& 10545408q_{15}q_{19} + 10545408q_{16}q_{18} - 2304q_0q_{35} - 4608q_1q_{34} - 1152q_2q_{33} - 1152q_3q_{32} - 2304q_4q_{31} - \\
& 21090816q_5q_{30} - 3456q_6q_{29} - 4608q_7q_{28} - 4608q_8q_{27} - 4608q_9q_{26} - 2304q_{10}q_{25} - 4608q_{11}q_{24} - 1152q_{12}q_{23} - \\
& 1152q_{13}q_{22} - 2304q_{14}q_{21} - 1152q_{15}q_{20} + 10545408q_{16}q_{19} + 10545408q_{17}q_{18} - 2304q_0q_{36} - 3456q_1q_{35} - \\
& 4608q_2q_{34} - 2304q_3q_{33} - 2304q_4q_{32} - 21090816q_5q_{31} - 21090816q_6q_{30} - 4608q_7q_{29} - 3456q_8q_{28} - \\
& 3456q_9q_{27} - 2304q_{10}q_{26} - 3456q_{11}q_{25} - 4608q_{12}q_{24} - 2304q_{13}q_{23} - 2304q_{14}q_{22} - 1152q_{15}q_{21} - 2304q_{16}q_{20} + \\
& 10545408q_{17}q_{19} - 2304q_0q_{37} - 4608q_1q_{36} - 3456q_2q_{35} - 3456q_3q_{34} - 2304q_4q_{33} - 21090816q_5q_{32} - \\
& 3456q_7q_{30} - 4608q_8q_{29} - 4608q_9q_{28} - 2304q_{10}q_{27} - 4608q_{11}q_{26} - 3456q_{12}q_{25} - 3456q_{13}q_{24} - 2304q_{14}q_{23} - \\
& 1152q_{15}q_{22} - 1152q_{16}q_{21} - 2304q_{17}q_{20} + 10545408q_{18}q_{19} - 2304q_0q_{38} - 4608q_1q_{37} - 3456q_2q_{36} - 4608q_3q_{35} - \\
& 3456q_4q_{34} - 21090816q_5q_{33} - 21090816q_7q_{31} - 6912q_8q_{30} - 3456q_9q_{29} - 2304q_{10}q_{28} - 4608q_{11}q_{27} - \\
& 3456q_{12}q_{26} - 4608q_{13}q_{25} - 3456q_{14}q_{24} - 1152q_{15}q_{23} - 2304q_{16}q_{22} - 2304q_{17}q_{21} - 2304q_{18}q_{20} - 2304q_0q_{39} - \\
& 3456q_1q_{38} - 3456q_2q_{37} - 3456q_3q_{36} - 4608q_4q_{35} - 6912q_8q_{31} - 3456q_9q_{30} - 2304q_{10}q_{29} - 3456q_{11}q_{28} - \\
& 3456q_{12}q_{27} - 3456q_{13}q_{26} - 4608q_{14}q_{25} - 2304q_{15}q_{24} - 2304q_{16}q_{23} - 2304q_{17}q_{22} - 2304q_{18}q_{21} - 1152q_{19}q_{20} - \\
& 1152q_0q_{40} - 3456q_1q_{39} - 4608q_2q_{38} - 4608q_3q_{37} - 4608q_4q_{36} - 21090816q_6q_{34} - 21090816q_8q_{32} - \\
& 3456q_9q_{31} - 1152q_{10}q_{30} - 3456q_{11}q_{29} - 4608q_{12}q_{28} - 4608q_{13}q_{27} - 4608q_{14}q_{26} - 2304q_{15}q_{25} - 4608q_{16}q_{24} - \\
& 1152q_{17}q_{23} - 1152q_{18}q_{22} - 2304q_{19}q_{21} - 1152q_0q_{41} - 2304q_1q_{40} - 4608q_2q_{39} - 3456q_3q_{38} - 3456q_4q_{37} - \\
& 21090816q_6q_{35} - 21090816q_7q_{34} - 6912q_9q_{32} - 1152q_{10}q_{31} - 2304q_{11}q_{30} - 4608q_{12}q_{29} - 3456q_{13}q_{28} - \\
& 3456q_{14}q_{27} - 2304q_{15}q_{26} - 3456q_{16}q_{25} - 4608q_{17}q_{24} - 2304q_{18}q_{23} - 2304q_{19}q_{22} - 1152q_0q_{42} - 1152q_1q_{41} - \\
& 2304q_2q_{40} - 4608q_3q_{39} - 4608q_4q_{38} - 21090816q_6q_{36} - 6912q_8q_{34} - 21090816q_9q_{33} - 1152q_{10}q_{32} - \\
& 1152q_{11}q_{31} - 2304q_{12}q_{30} - 4608q_{13}q_{29} - 4608q_{14}q_{28} - 2304q_{15}q_{27} - 4608q_{16}q_{26} - 3456q_{17}q_{25} - 3456q_{18}q_{24} - \\
& 2304q_{19}q_{23} - 1152q_0q_{43} - 2304q_1q_{42} - 2304q_2q_{41} - 2304q_3q_{40} - 3456q_4q_{39} - 21090816q_8q_{35} - 3456q_9q_{34} - \\
& 1152q_{10}q_{33} - 2304q_{11}q_{32} - 2304q_{12}q_{31} - 2304q_{13}q_{30} - 3456q_{14}q_{29} - 2304q_{15}q_{28} - 4608q_{16}q_{27} - 3456q_{17}q_{26} - \\
& 4608q_{18}q_{25} - 3456q_{19}q_{24} - 2304q_0q_{44} - 2304q_1q_{43} - 2304q_2q_{42} - 2304q_3q_{41} - 1152q_4q_{40} - 21090816q_7q_{37} - \\
& 6912q_9q_{35} - 2304q_{10}q_{34} - 2304q_{11}q_{33} - 2304q_{12}q_{32} - 2304q_{13}q_{31} - 1152q_{14}q_{30} - 2304q_{15}q_{29} - 3456q_{16}q_{28} - \\
& 3456q_{17}q_{27} - 3456q_{18}q_{26} - 4608q_{19}q_{25} - 2304q_0q_{45} - 4608q_1q_{44} - 1152q_2q_{43} - 1152q_3q_{42} - 2304q_4q_{41} - \\
& 1152q_5q_{40} - 21090816q_7q_{38} - 21090816q_8q_{37} - 21090816q_9q_{36} - 2304q_{10}q_{35} - 4608q_{11}q_{34} - 1152q_{12}q_{33} - \\
& 1152q_{13}q_{32} - 2304q_{14}q_{31} - 1152q_{15}q_{30} - 3456q_{16}q_{29} - 4608q_{17}q_{28} - 4608q_{18}q_{27} - 4608q_{19}q_{26} - 2304q_0q_{46} - \\
& 3456q_1q_{45} - 4608q_2q_{44} - 2304q_3q_{43} - 2304q_4q_{42} - 1152q_5q_{41} - 2304q_6q_{40} - 6912q_9q_{37} - 2304q_{10}q_{36} - \\
& 3456q_{11}q_{35} - 4608q_{12}q_{34} - 2304q_{13}q_{33} - 2304q_{14}q_{32} - 1152q_{15}q_{31} - 2304q_{16}q_{30} - 4608q_{17}q_{29} - 3456q_{18}q_{28} - \\
& 3456q_{19}q_{27} - 2304q_0q_{47} - 4608q_1q_{46} - 3456q_2q_{45} - 3456q_3q_{44} - 2304q_4q_{43} - 1152q_5q_{42} - 1152q_6q_{41} - \\
& 2304q_7q_{40} - 21090816q_8q_{39} - 21090816q_9q_{38} - 2304q_{10}q_{37} - 4608q_{11}q_{36} - 3456q_{12}q_{35} - 3456q_{13}q_{34} - \\
& 2304q_{14}q_{33} - 1152q_{15}q_{32} - 1152q_{16}q_{31} - 2304q_{17}q_{30} - 4608q_{18}q_{29} - 4608q_{19}q_{28} + 6912q_{20}q_{27} - 2304q_0q_{48} - \\
& 4608q_1q_{47} - 3456q_2q_{46} - 4608q_3q_{45} - 3456q_4q_{44} - 1152q_5q_{43} - 2304q_6q_{42} - 2304q_7q_{41} - 2304q_8q_{40} - \\
& 21090816q_9q_{39} - 2304q_{10}q_{38} - 4608q_{11}q_{37} - 3456q_{12}q_{36} - 4608q_{13}q_{35} - 3456q_{14}q_{34} - 1152q_{15}q_{33} - \\
& 2304q_{16}q_{32} - 2304q_{17}q_{31} - 2304q_{18}q_{30} - 3456q_{19}q_{29} - 2304q_0q_{49} - 3456q_1q_{48} - 3456q_2q_{47} - 3456q_3q_{46} - \\
& 4608q_4q_{45} - 2304q_5q_{44} - 2304q_6q_{43} - 2304q_7q_{42} - 2304q_8q_{41} - 1152q_9q_{40} - 2304q_{10}q_{39} - 3456q_{11}q_{38} - \\
& 3456q_{12}q_{37} - 3456q_{13}q_{36} - 4608q_{14}q_{35} - 2304q_{15}q_{34} - 2304q_{16}q_{33} - 2304q_{17}q_{32} - 2304q_{18}q_{31} - 1152q_{19}q_{30} + \\
& 6912q_{20}q_{29} - 1152q_0q_{50} - 3456q_1q_{49} - 4608q_2q_{48} - 4608q_3q_{47} - 4608q_4q_{46} - 2304q_5q_{45} - 4608q_6q_{44} - \\
& 1152q_7q_{43} - 1152q_8q_{42} - 2304q_9q_{41} - 21090816q_{10}q_{40} - 3456q_{11}q_{39} - 4608q_{12}q_{38} - 4608q_{13}q_{37} - \\
& 4608q_{14}q_{36} - 2304q_{15}q_{35} - 4608q_{16}q_{34} - 1152q_{17}q_{33} - 1152q_{18}q_{32} - 2304q_{19}q_{31} + 2304q_{20}q_{30} + 6912q_{21}q_{29} - \\
& 1152q_0q_{51} - 2304q_1q_{50} - 4608q_2q_{49} - 3456q_3q_{48} - 3456q_4q_{47} - 2304q_5q_{46} - 3456q_6q_{45} - 4608q_7q_{44} - \\
& 2304q_8q_{43} - 2304q_9q_{42} - 21090816q_{10}q_{41} - 21090816q_{11}q_{40} - 4608q_{12}q_{39} - 3456q_{13}q_{38} - 3456q_{14}q_{37} -
\end{aligned}$$

$$\begin{aligned}
& 2304q_{15}q_{36} - 3456q_{16}q_{35} - 4608q_{17}q_{34} - 2304q_{18}q_{33} - 2304q_{19}q_{32} - 1152q_0q_{52} - 1152q_1q_{51} - 2304q_2q_{50} - \\
& 4608q_3q_{49} - 4608q_4q_{48} - 2304q_5q_{47} - 4608q_6q_{46} - 3456q_7q_{45} - 3456q_8q_{44} - 2304q_9q_{43} - 21090816q_{10}q_{42} - \\
& 3456q_{12}q_{40} - 4608q_{13}q_{39} - 4608q_{14}q_{38} - 2304q_{15}q_{37} - 4608q_{16}q_{36} - 3456q_{17}q_{35} - 3456q_{18}q_{34} - 2304q_{19}q_{33} + \\
& 2304q_{21}q_{31} - 1152q_0q_{53} - 2304q_1q_{52} - 2304q_2q_{51} - 2304q_3q_{50} - 3456q_4q_{49} - 2304q_5q_{48} - 4608q_6q_{47} - \\
& 3456q_7q_{46} - 4608q_8q_{45} - 3456q_9q_{44} - 21090816q_{10}q_{43} - 21090816q_{12}q_{41} - 6912q_{13}q_{40} - 3456q_{14}q_{39} - \\
& 2304q_{15}q_{38} - 4608q_{16}q_{37} - 3456q_{17}q_{36} - 4608q_{18}q_{35} - 3456q_{19}q_{34} + 6912q_{24}q_{29} - 2304q_0q_{54} - 2304q_1q_{53} - \\
& 2304q_2q_{52} - 2304q_3q_{51} - 1152q_4q_{50} - 2304q_5q_{49} - 3456q_6q_{48} - 3456q_7q_{47} - 3456q_8q_{46} - 4608q_9q_{45} - \\
& 6912q_{13}q_{41} - 3456q_{14}q_{40} - 2304q_{15}q_{39} - 3456q_{16}q_{38} - 3456q_{17}q_{37} - 3456q_{18}q_{36} - 4608q_{19}q_{35} + 2304q_{20}q_{34} + \\
& 2304q_{22}q_{32} + 2304q_{24}q_{30} - 2304q_0q_{55} - 4608q_1q_{54} - 1152q_2q_{53} - 1152q_3q_{52} - 2304q_4q_{51} - 1152q_5q_{50} - \\
& 3456q_6q_{49} - 4608q_7q_{48} - 4608q_8q_{47} - 4608q_9q_{46} - 21090816q_{11}q_{44} - 21090816q_{13}q_{42} - 3456q_{14}q_{41} - \\
& 1152q_{15}q_{40} - 3456q_{16}q_{39} - 4608q_{17}q_{38} - 4608q_{18}q_{37} - 4608q_{19}q_{36} - 2304q_0q_{56} - 3456q_1q_{55} - 4608q_2q_{54} - \\
& 2304q_3q_{53} - 2304q_4q_{52} - 1152q_5q_{51} - 2304q_6q_{50} - 4608q_7q_{49} - 3456q_8q_{48} - 3456q_9q_{47} - 21090816q_{11}q_{45} - \\
& 21090816q_{12}q_{44} - 6912q_{14}q_{42} - 1152q_{15}q_{41} - 2304q_{16}q_{40} - 4608q_{17}q_{39} - 3456q_{18}q_{38} - 3456q_{19}q_{37} + \\
& 2304q_{21}q_{35} + 2304q_{22}q_{34} + 2304q_{23}q_{33} + 2304q_{24}q_{32} + 2304q_{25}q_{31} - 2304q_0q_{57} - 4608q_1q_{56} - 3456q_2q_{55} - \\
& 3456q_3q_{54} - 2304q_4q_{53} - 1152q_5q_{52} - 1152q_6q_{51} - 2304q_7q_{50} - 4608q_8q_{49} - 4608q_9q_{48} - 21090816q_{11}q_{46} - \\
& 6912q_{13}q_{44} - 21090816q_{14}q_{43} - 1152q_{15}q_{42} - 1152q_{16}q_{41} - 2304q_{17}q_{40} - 4608q_{18}q_{39} - 4608q_{19}q_{38} + \\
& 2304q_{20}q_{37} + 2304q_{27}q_{30} - 2304q_0q_{58} - 4608q_1q_{57} - 3456q_2q_{56} - 4608q_3q_{55} - 3456q_4q_{54} - 1152q_5q_{53} - \\
& 2304q_6q_{52} - 2304q_7q_{51} - 2304q_8q_{50} - 3456q_9q_{49} - 21090816q_{13}q_{45} - 3456q_{14}q_{44} - 1152q_{15}q_{43} - 2304q_{16}q_{42} - \\
& 2304q_{17}q_{41} - 2304q_{18}q_{40} - 3456q_{19}q_{39} + 2304q_{22}q_{36} + 2304q_{23}q_{35} + 4608q_{24}q_{34} + 2304q_{25}q_{33} + 2304q_{26}q_{32} - \\
& 2304q_0q_{59} - 3456q_1q_{58} - 3456q_2q_{57} - 3456q_3q_{56} - 4608q_4q_{55} - 2304q_5q_{54} - 2304q_6q_{53} - 2304q_7q_{52} - \\
& 2304q_8q_{51} - 1152q_9q_{50} - 21090816q_{12}q_{47} - 6912q_{14}q_{45} - 2304q_{15}q_{44} - 2304q_{16}q_{43} - 2304q_{17}q_{42} - \\
& 2304q_{18}q_{41} - 1152q_{19}q_{40} + 2304q_{20}q_{39} + 2304q_{21}q_{38} + 2304q_{23}q_{36} + 2304q_{26}q_{33} + 2304q_{28}q_{31} + 2304q_{29}q_{30} - \\
& 3456q_1q_{59} - 4608q_2q_{58} - 4608q_3q_{57} - 4608q_4q_{56} - 2304q_5q_{55} - 4608q_6q_{54} - 1152q_7q_{53} - 1152q_8q_{52} - \\
& 2304q_9q_{51} - 1152q_{10}q_{50} - 21090816q_{12}q_{48} - 21090816q_{13}q_{47} - 21090816q_{14}q_{46} - 2304q_{15}q_{45} - 4608q_{16}q_{44} - \\
& 1152q_{17}q_{43} - 1152q_{18}q_{42} - 2304q_{19}q_{41} + 2304q_{20}q_{40} + 2304q_{21}q_{39} + 2304q_{22}q_{38} + 2304q_{23}q_{37} + 2304q_{24}q_{36} + \\
& 4608q_{25}q_{35} + 2304q_{26}q_{34} + 2304q_{27}q_{33} + 2304q_{28}q_{32} + 2304q_{29}q_{31} - 4608q_2q_{59} - 3456q_3q_{58} - 3456q_4q_{57} - \\
& 2304q_5q_{56} - 3456q_6q_{55} - 4608q_7q_{54} - 2304q_8q_{53} - 2304q_9q_{52} - 1152q_{10}q_{51} - 2304q_{11}q_{50} - 6912q_{14}q_{47} - \\
& 2304q_{15}q_{46} - 3456q_{16}q_{45} - 4608q_{17}q_{44} - 2304q_{18}q_{43} - 2304q_{19}q_{42} + 2304q_{24}q_{37} + 2304q_{25}q_{36} + 2304q_{26}q_{35} + \\
& 2304q_{27}q_{34} - 4608q_3q_{59} - 4608q_4q_{58} - 2304q_5q_{57} - 4608q_6q_{56} - 3456q_7q_{55} - 3456q_8q_{54} - 2304q_9q_{53} - \\
& 1152q_{10}q_{52} - 1152q_{11}q_{51} - 2304q_{12}q_{50} - 21090816q_{13}q_{49} - 21090816q_{14}q_{48} - 2304q_{15}q_{47} - 4608q_{16}q_{46} - \\
& 3456q_{17}q_{45} - 3456q_{18}q_{44} - 2304q_{19}q_{43} + 2304q_{21}q_{41} + 2304q_{24}q_{38} + 2304q_{25}q_{37} + 4608q_{26}q_{36} + 2304q_{27}q_{35} + \\
& 2304q_{28}q_{34} - 3456q_4q_{59} - 2304q_5q_{58} - 4608q_6q_{57} - 3456q_7q_{56} - 4608q_8q_{55} - 3456q_9q_{54} - 1152q_{10}q_{53} - \\
& 2304q_{11}q_{52} - 2304q_{12}q_{51} - 2304q_{13}q_{50} - 21090816q_{14}q_{49} - 2304q_{15}q_{48} - 4608q_{16}q_{47} - 3456q_{17}q_{46} - \\
& 4608q_{18}q_{45} - 3456q_{19}q_{44} + 2304q_{24}q_{39} + 2304q_{25}q_{38} + 2304q_{26}q_{37} + 2304q_{27}q_{36} + 2304q_{28}q_{35} + 2304q_{29}q_{34} - \\
& 2304q_5q_{59} - 3456q_6q_{58} - 3456q_7q_{57} - 3456q_8q_{56} - 4608q_9q_{55} - 2304q_{10}q_{54} - 2304q_{11}q_{53} - 2304q_{12}q_{52} - \\
& 2304q_{13}q_{51} - 1152q_{14}q_{50} - 2304q_{15}q_{49} - 3456q_{16}q_{48} - 3456q_{17}q_{47} - 3456q_{18}q_{46} - 4608q_{19}q_{45} + 2304q_{20}q_{44} + \\
& 2304q_{22}q_{42} + 2304q_{24}q_{40} + 2304q_{25}q_{39} + 2304q_{26}q_{38} + 4608q_{27}q_{37} + 2304q_{28}q_{36} + 2304q_{29}q_{35} - 3456q_6q_{59} - \\
& 4608q_7q_{58} - 4608q_8q_{57} - 4608q_9q_{56} - 2304q_{10}q_{55} - 4608q_{11}q_{54} - 1152q_{12}q_{53} - 1152q_{13}q_{52} - 2304q_{14}q_{51} - \\
& 21090816q_{15}q_{50} - 3456q_{16}q_{49} - 4608q_{17}q_{48} - 4608q_{18}q_{47} - 4608q_{19}q_{46} - 4608q_7q_{59} - 3456q_8q_{58} - \\
& 3456q_9q_{57} - 2304q_{10}q_{56} - 3456q_{11}q_{55} - 4608q_{12}q_{54} - 2304q_{13}q_{53} - 2304q_{14}q_{52} - 21090816q_{15}q_{51} - \\
& 21090816q_{16}q_{50} - 4608q_{17}q_{49} - 3456q_{18}q_{48} - 3456q_{19}q_{47} + 2304q_{21}q_{45} + 2304q_{22}q_{44} + 2304q_{23}q_{43} + \\
& 2304q_{24}q_{42} + 2304q_{25}q_{41} + 2304q_{27}q_{39} + 4608q_{28}q_{38} + 2304q_{29}q_{37} - 4608q_8q_{59} - 4608q_9q_{58} - 2304q_{10}q_{57} - \\
& 4608q_{11}q_{56} - 3456q_{12}q_{55} - 3456q_{13}q_{54} - 2304q_{14}q_{53} - 21090816q_{15}q_{52} - 3456q_{17}q_{50} - 4608q_{18}q_{49} - \\
& 4608q_{19}q_{48} + 2304q_{20}q_{47} + 2304q_{27}q_{40} + 2304q_{28}q_{39} + 2304q_{29}q_{38} + 6912q_{30}q_{37} - 3456q_9q_{59} - 2304q_{10}q_{58} - \\
& 4608q_{11}q_{57} - 3456q_{12}q_{56} - 4608q_{13}q_{55} - 3456q_{14}q_{54} - 21090816q_{15}q_{53} - 21090816q_{17}q_{51} - 6912q_{18}q_{50} - \\
& 3456q_{19}q_{49} + 2304q_{22}q_{46} + 2304q_{23}q_{45} + 4608q_{24}q_{44} + 2304q_{25}q_{43} + 2304q_{26}q_{42} + 4608q_{29}q_{39} - 2304q_{10}q_{59} - \\
& 3456q_{11}q_{58} - 3456q_{12}q_{57} - 3456q_{13}q_{56} - 4608q_{14}q_{55} - 6912q_{18}q_{51} - 3456q_{19}q_{50} + 2304q_{20}q_{49} + 2304q_{21}q_{48} + \\
& 2304q_{23}q_{46} + 2304q_{26}q_{43} + 2304q_{28}q_{41} + 2304q_{29}q_{40} + 6912q_{30}q_{39} - 3456q_{11}q_{59} - 4608q_{12}q_{58} - 4608q_{13}q_{57} -
\end{aligned}$$

$$\begin{aligned}
& 4608q_{14}q_{56} - 21090816q_{16}q_{54} - 21090816q_{18}q_{52} - 3456q_{19}q_{51} + 2304q_{20}q_{50} + 2304q_{21}q_{49} + 2304q_{22}q_{48} + \\
& 2304q_{23}q_{47} + 2304q_{24}q_{46} + 4608q_{25}q_{45} + 2304q_{26}q_{44} + 2304q_{27}q_{43} + 2304q_{28}q_{42} + 2304q_{29}q_{41} + 2304q_{30}q_{40} + \\
& 6912q_{31}q_{39} - 4608q_{12}q_{59} - 3456q_{13}q_{58} - 3456q_{14}q_{57} - 21090816q_{16}q_{55} - 21090816q_{17}q_{54} - 6912q_{19}q_{52} + \\
& 2304q_{24}q_{47} + 2304q_{25}q_{46} + 2304q_{26}q_{45} + 2304q_{27}q_{44} - 4608q_{13}q_{59} - 4608q_{14}q_{58} - 21090816q_{16}q_{56} - \\
& 6912q_{18}q_{54} - 21090816q_{19}q_{53} + 2304q_{21}q_{51} + 2304q_{24}q_{48} + 2304q_{25}q_{47} + 4608q_{26}q_{46} + 2304q_{27}q_{45} + \\
& 2304q_{28}q_{44} + 2304q_{31}q_{41} - 3456q_{14}q_{59} - 21090816q_{18}q_{55} - 3456q_{19}q_{54} + 2304q_{24}q_{49} + 2304q_{25}q_{48} + \\
& 2304q_{26}q_{47} + 2304q_{27}q_{46} + 2304q_{28}q_{45} + 2304q_{29}q_{44} + 6912q_{34}q_{39} - 21090816q_{17}q_{57} - 6912q_{19}q_{55} + \\
& 2304q_{20}q_{54} + 2304q_{22}q_{52} + 2304q_{24}q_{50} + 2304q_{25}q_{49} + 2304q_{26}q_{48} + 4608q_{27}q_{47} + 2304q_{28}q_{46} + 2304q_{29}q_{45} + \\
& 2304q_{30}q_{44} + 2304q_{32}q_{42} + 2304q_{34}q_{40} - 21090816q_{17}q_{58} - 21090816q_{18}q_{57} - 21090816q_{19}q_{56} - 6912q_{19}q_{57} + \\
& 2304q_{21}q_{55} + 2304q_{22}q_{54} + 2304q_{23}q_{53} + 2304q_{24}q_{52} + 2304q_{25}q_{51} + 2304q_{27}q_{49} + 4608q_{28}q_{48} + 2304q_{29}q_{47} + \\
& 2304q_{31}q_{45} + 2304q_{32}q_{44} + 2304q_{33}q_{43} + 2304q_{34}q_{42} + 2304q_{35}q_{41} - 21090816q_{18}q_{59} - 21090816q_{19}q_{58} + \\
& 2304q_{20}q_{57} + 2304q_{27}q_{50} + 2304q_{28}q_{49} + 2304q_{29}q_{48} + 2304q_{30}q_{47} + 2304q_{37}q_{40} - 21090816q_{19}q_{59} + \\
& 2304q_{22}q_{56} + 2304q_{23}q_{55} + 4608q_{24}q_{54} + 2304q_{25}q_{53} + 2304q_{26}q_{52} + 4608q_{29}q_{49} + 2304q_{32}q_{46} + 2304q_{33}q_{45} + \\
& 4608q_{34}q_{44} + 2304q_{35}q_{43} + 2304q_{36}q_{42} + 2304q_{20}q_{59} + 2304q_{21}q_{58} + 2304q_{23}q_{56} + 2304q_{26}q_{53} + 2304q_{28}q_{51} + \\
& 2304q_{29}q_{50} + 2304q_{30}q_{49} + 2304q_{31}q_{48} + 2304q_{33}q_{46} + 2304q_{36}q_{43} + 2304q_{38}q_{41} + 2304q_{39}q_{40} + 2304q_{21}q_{59} + \\
& 2304q_{22}q_{58} + 2304q_{23}q_{57} + 2304q_{24}q_{56} + 4608q_{25}q_{55} + 2304q_{26}q_{54} + 2304q_{27}q_{53} + 2304q_{28}q_{52} + 2304q_{29}q_{51} + \\
& 2304q_{30}q_{50} + 2304q_{31}q_{49} + 2304q_{32}q_{48} + 2304q_{33}q_{47} + 2304q_{34}q_{46} + 4608q_{35}q_{45} + 2304q_{36}q_{44} + 2304q_{37}q_{43} + \\
& 2304q_{38}q_{42} + 2304q_{39}q_{41} + 2304q_{24}q_{57} + 2304q_{25}q_{56} + 2304q_{26}q_{55} + 2304q_{27}q_{54} + 2304q_{34}q_{47} + 2304q_{35}q_{46} + \\
& 2304q_{36}q_{45} + 2304q_{37}q_{44} + 2304q_{24}q_{58} + 2304q_{25}q_{57} + 4608q_{26}q_{56} + 2304q_{27}q_{55} + 2304q_{28}q_{54} + 2304q_{31}q_{51} + \\
& 2304q_{34}q_{48} + 2304q_{35}q_{47} + 4608q_{36}q_{46} + 2304q_{37}q_{45} + 2304q_{38}q_{44} + 2304q_{24}q_{59} + 2304q_{25}q_{58} + 2304q_{26}q_{57} + \\
& 2304q_{27}q_{56} + 2304q_{28}q_{55} + 2304q_{29}q_{54} + 2304q_{34}q_{49} + 2304q_{35}q_{48} + 2304q_{36}q_{47} + 2304q_{37}q_{46} + 2304q_{38}q_{45} + \\
& 2304q_{39}q_{44} + 2304q_{25}q_{59} + 2304q_{26}q_{58} + 4608q_{27}q_{57} + 2304q_{28}q_{56} + 2304q_{29}q_{55} + 2304q_{30}q_{54} + 2304q_{32}q_{52} + \\
& 2304q_{34}q_{50} + 2304q_{35}q_{49} + 2304q_{36}q_{48} + 4608q_{37}q_{47} + 2304q_{38}q_{46} + 2304q_{39}q_{45} + 2304q_{27}q_{59} + 4608q_{28}q_{58} + \\
& 2304q_{29}q_{57} + 2304q_{31}q_{55} + 2304q_{32}q_{54} + 2304q_{33}q_{53} + 2304q_{34}q_{52} + 2304q_{35}q_{51} + 2304q_{37}q_{49} + 4608q_{38}q_{48} + \\
& 2304q_{39}q_{47} + 2304q_{28}q_{59} + 2304q_{29}q_{58} + 2304q_{30}q_{57} + 2304q_{37}q_{50} + 2304q_{38}q_{49} + 2304q_{39}q_{48} + 6912q_{40}q_{47} + \\
& 4608q_{29}q_{59} + 2304q_{32}q_{56} + 2304q_{33}q_{55} + 4608q_{34}q_{54} + 2304q_{35}q_{53} + 2304q_{36}q_{52} + 4608q_{39}q_{49} + 2304q_{30}q_{59} + \\
& 2304q_{31}q_{58} + 2304q_{33}q_{56} + 2304q_{36}q_{53} + 2304q_{38}q_{51} + 2304q_{39}q_{50} + 6912q_{40}q_{49} + 2304q_{31}q_{59} + 2304q_{32}q_{58} + \\
& 2304q_{33}q_{57} + 2304q_{34}q_{56} + 4608q_{35}q_{55} + 2304q_{36}q_{54} + 2304q_{37}q_{53} + 2304q_{38}q_{52} + 2304q_{39}q_{51} + 2304q_{40}q_{50} + \\
& 6912q_{41}q_{49} + 2304q_{34}q_{57} + 2304q_{35}q_{56} + 2304q_{36}q_{55} + 2304q_{37}q_{54} + 2304q_{34}q_{58} + 2304q_{35}q_{57} + 4608q_{36}q_{56} + \\
& 2304q_{37}q_{55} + 2304q_{38}q_{54} + 2304q_{41}q_{51} + 2304q_{34}q_{59} + 2304q_{35}q_{58} + 2304q_{36}q_{57} + 2304q_{37}q_{56} + 2304q_{38}q_{55} + \\
& 2304q_{39}q_{54} + 6912q_{44}q_{49} + 2304q_{35}q_{59} + 2304q_{36}q_{58} + 4608q_{37}q_{57} + 2304q_{38}q_{56} + 2304q_{39}q_{55} + 2304q_{40}q_{54} + \\
& 2304q_{42}q_{52} + 2304q_{44}q_{50} + 2304q_{37}q_{59} + 4608q_{38}q_{58} + 2304q_{39}q_{57} + 2304q_{41}q_{55} + 2304q_{42}q_{54} + 2304q_{43}q_{53} + \\
& 2304q_{44}q_{52} + 2304q_{45}q_{51} + 2304q_{38}q_{59} + 2304q_{39}q_{58} + 2304q_{40}q_{57} + 2304q_{47}q_{50} + 4608q_{39}q_{59} + 2304q_{42}q_{56} + \\
& 2304q_{43}q_{55} + 4608q_{44}q_{54} + 2304q_{45}q_{53} + 2304q_{46}q_{52} + 2304q_{40}q_{59} + 2304q_{41}q_{58} + 2304q_{43}q_{56} + 2304q_{46}q_{53} + \\
& 2304q_{48}q_{51} + 2304q_{49}q_{50} + 2304q_{41}q_{59} + 2304q_{42}q_{58} + 2304q_{43}q_{57} + 2304q_{44}q_{56} + 4608q_{45}q_{55} + 2304q_{46}q_{54} + \\
& 2304q_{47}q_{53} + 2304q_{48}q_{52} + 2304q_{49}q_{51} + 2304q_{44}q_{57} + 2304q_{45}q_{56} + 2304q_{46}q_{55} + 2304q_{47}q_{54} + 2304q_{44}q_{58} + \\
& 2304q_{45}q_{57} + 4608q_{46}q_{56} + 2304q_{47}q_{55} + 2304q_{48}q_{54} + 2304q_{44}q_{59} + 2304q_{45}q_{58} + 2304q_{46}q_{57} + 2304q_{47}q_{56} + \\
& 2304q_{48}q_{55} + 2304q_{49}q_{54} + 2304q_{45}q_{59} + 2304q_{46}q_{58} + 4608q_{47}q_{57} + 2304q_{48}q_{56} + 2304q_{49}q_{55} + 2304q_{47}q_{59} + \\
& 4608q_{48}q_{58} + 2304q_{49}q_{57} + 2304q_{48}q_{59} + 2304q_{49}q_{58} + 6912q_{50}q_{57} + 4608q_{49}q_{59} + 6912q_{50}q_{59} + 6912q_{51}q_{59} + \\
& 6912q_{54}q_{59} + 93312
\end{aligned}$$

A complete expression of $E_2(s)$ for 36-order Williamson based method or 108-order Baumert-Hall based method

$$\begin{aligned}
E_2(s) = & 10555200s_0 + 10561680s_1 + 10562544s_2 + 10566864s_3 + 10569456s_4 + 10555200s_5 + 10561680s_6 + \\
& 10562544s_7 + 10566864s_8 + 10569456s_9 + 10555200s_{10} + 10561680s_{11} + 10562544s_{12} + 10566864s_{13} + \\
& 10569456s_{14} + 10555200s_{15} + 10561680s_{16} + 10562544s_{17} + 10566864s_{18} + 10569456s_{19} - 5278752s_{20} - \\
& 5277888s_{21} - 5277600s_{22} - 5278752s_{23} - 5282208s_{24} - 5281920s_{25} - 5283072s_{26} - 5283648s_{27} - 5283072s_{28} - \\
& 5288832s_{29} - 5278752s_{30} - 5277888s_{31} - 5277600s_{32} - 5278752s_{33} - 5282208s_{34} - 5281920s_{35} - 5283072s_{36} -
\end{aligned}$$

$$\begin{aligned}
& 5283648s_{37} - 5283072s_{38} - 5288832s_{39} - 5278752s_{40} - 5277888s_{41} - 5277600s_{42} - 5278752s_{43} - 5282208s_{44} - \\
& 5281920s_{45} - 5283072s_{46} - 5283648s_{47} - 5283072s_{48} - 5288832s_{49} - 5278752s_{50} - 5277888s_{51} - 5277600s_{52} - \\
& 5278752s_{53} - 5282208s_{54} - 5281920s_{55} - 5283072s_{56} - 5283648s_{57} - 5283072s_{58} - 5288832s_{59} + 2636352s_0s_1 + \\
& 2636352s_0s_2 + 2636352s_0s_3 + 2636352s_1s_2 + 2636352s_0s_4 + 2636352s_1s_3 + 576s_0s_5 + 2636352s_1s_4 + \\
& 2636352s_2s_3 + 1008s_0s_6 + 1008s_1s_5 + 2636352s_2s_4 + 1008s_0s_7 + 1872s_1s_6 + 1008s_2s_5 + 2636352s_3s_4 + 1008s_0s_8 + \\
& 1728s_1s_7 + 1728s_2s_6 + 1008s_3s_5 + 1008s_0s_9 + 1728s_1s_8 + 1872s_2s_7 + 1728s_3s_6 + 1008s_4s_5 + 576s_0s_{10} + 1728s_1s_9 + \\
& 1728s_2s_8 + 1728s_3s_7 + 1728s_4s_6 + 1008s_0s_{11} + 1008s_1s_{10} + 1728s_2s_9 + 1872s_3s_8 + 1728s_4s_7 + 2636352s_5s_6 + \\
& 1008s_0s_{12} + 1872s_1s_{11} + 1008s_2s_{10} + 1728s_3s_9 + 1728s_4s_8 + 2636352s_5s_7 + 1008s_0s_{13} + 1728s_1s_{12} + 1728s_2s_{11} + \\
& 1008s_3s_{10} + 1872s_4s_9 + 2636352s_5s_8 + 2636352s_6s_7 + 1008s_0s_{14} + 1728s_1s_{13} + 1872s_2s_{12} + 1728s_3s_{11} + \\
& 1008s_4s_{10} + 2636352s_5s_9 + 2636352s_6s_8 + 576s_0s_{15} + 1728s_1s_{14} + 1728s_2s_{13} + 1728s_3s_{12} + 1728s_4s_{11} + 576s_5s_{10} + \\
& 2636352s_6s_9 + 2636352s_7s_8 + 1008s_0s_{16} + 1008s_1s_{15} + 1728s_2s_{14} + 1872s_3s_{13} + 1728s_4s_{12} + 1008s_5s_{11} + \\
& 1008s_6s_{10} + 2636352s_7s_9 + 1008s_0s_{17} + 1872s_1s_{16} + 1008s_2s_{15} + 1728s_3s_{14} + 1728s_4s_{13} + 1008s_5s_{12} + 1872s_6s_{11} + \\
& 1008s_7s_{10} + 2636352s_8s_9 + 1008s_0s_{18} + 1728s_1s_{17} + 1728s_2s_{16} + 1008s_3s_{15} + 1872s_4s_{14} + 1008s_5s_{13} + 1728s_6s_{12} + \\
& 1728s_7s_{11} + 1008s_8s_{10} + 1008s_0s_{19} + 1728s_1s_{18} + 1872s_2s_{17} + 1728s_3s_{16} + 1008s_4s_{15} + 1008s_5s_{14} + 1728s_6s_{13} + \\
& 1872s_7s_{12} + 1728s_8s_{11} + 1008s_9s_{10} - 5272704s_0s_{20} + 1728s_1s_{19} + 1728s_2s_{18} + 1728s_3s_{17} + 1728s_4s_{16} + 576s_5s_{15} + \\
& 1728s_6s_{14} + 1728s_7s_{13} + 1728s_8s_{12} + 1728s_9s_{11} - 5272704s_0s_{21} - 5272704s_1s_{20} + 1728s_2s_{19} + 1872s_3s_{18} + \\
& 1728s_4s_{17} + 1008s_5s_{16} + 1008s_6s_{15} + 1728s_7s_{14} + 1872s_8s_{13} + 1728s_9s_{12} + 2636352s_{10}s_{11} - 5272704s_0s_{22} - \\
& 864s_2s_{20} + 1728s_3s_{19} + 1728s_4s_{18} + 1008s_5s_{17} + 1872s_6s_{16} + 1008s_7s_{15} + 1728s_8s_{14} + 1728s_9s_{13} + 2636352s_{10}s_{12} - \\
& 5272704s_0s_{23} - 5272704s_2s_{21} - 1728s_3s_{20} + 1872s_4s_{19} + 1008s_5s_{18} + 1728s_6s_{17} + 1728s_7s_{16} + 1008s_8s_{15} + \\
& 1872s_9s_{14} + 2636352s_{10}s_{13} + 2636352s_{11}s_{12} - 1728s_3s_{21} - 864s_4s_{20} + 1008s_5s_{19} + 1728s_6s_{18} + 1872s_7s_{17} + \\
& 1728s_8s_{16} + 1008s_9s_{15} + 2636352s_{10}s_{14} + 2636352s_{11}s_{13} - 5272704s_1s_{24} - 5272704s_3s_{22} - 864s_4s_{21} - 288s_5s_{20} + \\
& 1728s_6s_{19} + 1728s_7s_{18} + 1728s_8s_{17} + 1728s_9s_{16} + 576s_{10}s_{15} + 2636352s_{11}s_{14} + 2636352s_{12}s_{13} - 5272704s_1s_{25} - \\
& 5272704s_2s_{24} - 1728s_4s_{22} - 288s_5s_{21} - 576s_6s_{20} + 1728s_7s_{19} + 1872s_8s_{18} + 1728s_9s_{17} + 1008s_{10}s_{16} + 1008s_{11}s_{15} + \\
& 2636352s_{12}s_{14} - 5272704s_1s_{26} - 1728s_3s_{24} - 5272704s_4s_{23} - 288s_5s_{22} - 288s_6s_{21} - 576s_7s_{20} + 1728s_8s_{19} + \\
& 1728s_9s_{18} + 1008s_{10}s_{17} + 1872s_{11}s_{16} + 1008s_{12}s_{15} + 2636352s_{13}s_{14} - 5272704s_3s_{25} - 864s_4s_{24} - 288s_5s_{23} - \\
& 576s_6s_{22} - 576s_7s_{21} - 576s_8s_{20} + 1872s_9s_{19} + 1008s_{10}s_{18} + 1728s_{11}s_{17} + 1728s_{12}s_{16} + 1008s_{13}s_{15} - 5272704s_2s_{27} - \\
& 1728s_4s_{25} - 576s_5s_{24} - 576s_6s_{23} - 576s_7s_{22} - 576s_8s_{21} - 288s_9s_{20} + 1008s_{10}s_{19} + 1728s_{11}s_{18} + 1872s_{12}s_{17} + \\
& 1728s_{13}s_{16} + 1008s_{14}s_{15} - 288s_0s_{30} - 5272704s_2s_{28} - 5272704s_3s_{27} - 5272704s_4s_{26} - 576s_5s_{25} - 1152s_6s_{24} - \\
& 288s_7s_{23} - 288s_8s_{22} - 576s_9s_{21} - 288s_{10}s_{20} + 1728s_{11}s_{19} + 1728s_{12}s_{18} + 1728s_{13}s_{17} + 1728s_{14}s_{16} - 288s_0s_{31} - \\
& 576s_1s_{30} - 1728s_4s_{27} - 576s_5s_{26} - 864s_6s_{25} - 1152s_7s_{24} - 576s_8s_{23} - 576s_9s_{22} - 288s_{10}s_{21} - 576s_{11}s_{20} + \\
& 1728s_{12}s_{19} + 1872s_{13}s_{18} + 1728s_{14}s_{17} + 2636352s_{15}s_{16} - 288s_0s_{32} - 288s_1s_{31} - 576s_2s_{30} - 5272704s_3s_{29} - \\
& 5272704s_4s_{28} - 576s_5s_{27} - 1152s_6s_{26} - 864s_7s_{25} - 864s_8s_{24} - 576s_9s_{23} - 288s_{10}s_{22} - 288s_{11}s_{21} - 576s_{12}s_{20} + \\
& 1728s_{13}s_{19} + 1728s_{14}s_{18} + 2636352s_{15}s_{17} - 288s_0s_{33} - 576s_1s_{32} - 576s_2s_{31} - 576s_3s_{30} - 5272704s_4s_{29} - \\
& 576s_5s_{28} - 1152s_6s_{27} - 864s_7s_{26} - 1152s_8s_{25} - 864s_9s_{24} - 288s_{10}s_{23} - 576s_{11}s_{22} - 576s_{12}s_{21} - 576s_{13}s_{20} + \\
& 1872s_{14}s_{19} + 2636352s_{15}s_{18} + 2636352s_{16}s_{17} - 576s_0s_{34} - 576s_1s_{33} - 576s_2s_{32} - 576s_3s_{31} - 288s_4s_{30} - 576s_5s_{29} - \\
& 864s_6s_{28} - 864s_7s_{27} - 864s_8s_{26} - 1152s_9s_{25} - 576s_{10}s_{24} - 576s_{11}s_{23} - 576s_{12}s_{22} - 576s_{13}s_{21} - 288s_{14}s_{20} + \\
& 2636352s_{15}s_{19} + 2636352s_{16}s_{18} - 576s_0s_{35} - 1152s_1s_{34} - 288s_2s_{33} - 288s_3s_{32} - 576s_4s_{31} - 5272704s_5s_{30} - \\
& 864s_6s_{29} - 1152s_7s_{28} - 1152s_8s_{27} - 1152s_9s_{26} - 576s_{10}s_{25} - 1152s_{11}s_{24} - 288s_{12}s_{23} - 288s_{13}s_{22} - 576s_{14}s_{21} - \\
& 288s_{15}s_{20} + 2636352s_{16}s_{19} + 2636352s_{17}s_{18} - 576s_0s_{36} - 864s_1s_{35} - 1152s_2s_{34} - 576s_3s_{33} - 576s_4s_{32} - \\
& 5272704s_5s_{31} - 5272704s_6s_{30} - 1152s_7s_{29} - 864s_8s_{28} - 864s_9s_{27} - 576s_{10}s_{26} - 864s_{11}s_{25} - 1152s_{12}s_{24} - \\
& 576s_{13}s_{23} - 576s_{14}s_{22} - 288s_{15}s_{21} - 576s_{16}s_{20} + 2636352s_{17}s_{19} - 576s_0s_{37} - 1152s_1s_{36} - 864s_2s_{35} - 864s_3s_{34} - \\
& 576s_4s_{33} - 5272704s_5s_{32} - 864s_7s_{30} - 1152s_8s_{29} - 1152s_9s_{28} - 576s_{10}s_{27} - 1152s_{11}s_{26} - 864s_{12}s_{25} - 864s_{13}s_{24} - \\
& 576s_{14}s_{23} - 288s_{15}s_{22} - 288s_{16}s_{21} - 576s_{17}s_{20} + 2636352s_{18}s_{19} - 576s_0s_{38} - 1152s_1s_{37} - 864s_2s_{36} - 1152s_3s_{35} - \\
& 864s_4s_{34} - 5272704s_5s_{33} - 5272704s_7s_{31} - 1728s_8s_{30} - 864s_9s_{29} - 576s_{10}s_{28} - 1152s_{11}s_{27} - 864s_{12}s_{26} - \\
& 1152s_{13}s_{25} - 864s_{14}s_{24} - 288s_{15}s_{23} - 576s_{16}s_{22} - 576s_{17}s_{21} - 576s_{18}s_{20} - 576s_0s_{39} - 864s_1s_{38} - 864s_2s_{37} - \\
& 864s_3s_{36} - 1152s_4s_{35} - 1728s_8s_{31} - 864s_9s_{30} - 576s_{10}s_{29} - 864s_{11}s_{28} - 864s_{12}s_{27} - 864s_{13}s_{26} - 1152s_{14}s_{25} - \\
& 576s_{15}s_{24} - 576s_{16}s_{23} - 576s_{17}s_{22} - 576s_{18}s_{21} - 288s_{19}s_{20} - 288s_0s_{40} - 864s_1s_{39} - 1152s_2s_{38} - 1152s_3s_{37} - \\
& 1152s_4s_{36} - 5272704s_6s_{34} - 5272704s_8s_{32} - 864s_9s_{31} - 288s_{10}s_{30} - 864s_{11}s_{29} - 1152s_{12}s_{28} - 1152s_{13}s_{27} -
\end{aligned}$$

$1152s_{14}s_{26} - 576s_{15}s_{25} - 1152s_{16}s_{24} - 288s_{17}s_{23} - 288s_{18}s_{22} - 576s_{19}s_{21} - 288s_{0}s_{41} - 576s_{1}s_{40} - 1152s_{2}s_{39} -$
 $864s_{3}s_{38} - 864s_{4}s_{37} - 5272704s_{6}s_{35} - 5272704s_{7}s_{34} - 1728s_{9}s_{32} - 288s_{10}s_{31} - 576s_{11}s_{30} - 1152s_{12}s_{29} -$
 $864s_{13}s_{28} - 864s_{14}s_{27} - 576s_{15}s_{26} - 864s_{16}s_{25} - 1152s_{17}s_{24} - 576s_{18}s_{23} - 576s_{19}s_{22} - 288s_{0}s_{42} - 288s_{1}s_{41} -$
 $576s_{2}s_{40} - 1152s_{3}s_{39} - 1152s_{4}s_{38} - 5272704s_{6}s_{36} - 1728s_{8}s_{34} - 5272704s_{9}s_{33} - 288s_{10}s_{32} - 288s_{11}s_{31} -$
 $576s_{12}s_{30} - 1152s_{13}s_{29} - 1152s_{14}s_{28} - 576s_{15}s_{27} - 1152s_{16}s_{26} - 864s_{17}s_{25} - 864s_{18}s_{24} - 576s_{19}s_{23} - 288s_{0}s_{43} -$
 $576s_{1}s_{42} - 576s_{2}s_{41} - 576s_{3}s_{40} - 864s_{4}s_{39} - 5272704s_{8}s_{35} - 864s_{9}s_{34} - 288s_{10}s_{33} - 576s_{11}s_{32} - 576s_{12}s_{31} -$
 $576s_{13}s_{30} - 864s_{14}s_{29} - 576s_{15}s_{28} - 1152s_{16}s_{27} - 864s_{17}s_{26} - 1152s_{18}s_{25} - 864s_{19}s_{24} - 576s_{0}s_{44} - 576s_{1}s_{43} -$
 $576s_{2}s_{42} - 576s_{3}s_{41} - 288s_{4}s_{40} - 5272704s_{7}s_{37} - 1728s_{9}s_{35} - 576s_{10}s_{34} - 576s_{11}s_{33} - 576s_{12}s_{32} - 576s_{13}s_{31} -$
 $288s_{14}s_{30} - 576s_{15}s_{29} - 864s_{16}s_{28} - 864s_{17}s_{27} - 864s_{18}s_{26} - 1152s_{19}s_{25} - 576s_{0}s_{45} - 1152s_{1}s_{44} - 288s_{2}s_{43} -$
 $288s_{3}s_{42} - 576s_{4}s_{41} - 288s_{5}s_{40} - 5272704s_{7}s_{38} - 5272704s_{8}s_{37} - 5272704s_{9}s_{36} - 576s_{10}s_{35} - 1152s_{11}s_{34} -$
 $288s_{12}s_{33} - 288s_{13}s_{32} - 576s_{14}s_{31} - 288s_{15}s_{30} - 864s_{16}s_{29} - 1152s_{17}s_{28} - 1152s_{18}s_{27} - 1152s_{19}s_{26} - 576s_{0}s_{46} -$
 $864s_{1}s_{45} - 1152s_{2}s_{44} - 576s_{3}s_{43} - 576s_{4}s_{42} - 288s_{5}s_{41} - 576s_{6}s_{40} - 1728s_{9}s_{37} - 576s_{10}s_{36} - 864s_{11}s_{35} -$
 $1152s_{12}s_{34} - 576s_{13}s_{33} - 576s_{14}s_{32} - 288s_{15}s_{31} - 576s_{16}s_{30} - 1152s_{17}s_{29} - 864s_{18}s_{28} - 864s_{19}s_{27} - 576s_{0}s_{47} -$
 $1152s_{1}s_{46} - 864s_{2}s_{45} - 864s_{3}s_{44} - 576s_{4}s_{43} - 288s_{5}s_{42} - 288s_{6}s_{41} - 576s_{7}s_{40} - 5272704s_{8}s_{39} - 5272704s_{9}s_{38} -$
 $576s_{10}s_{37} - 1152s_{11}s_{36} - 864s_{12}s_{35} - 864s_{13}s_{34} - 576s_{14}s_{33} - 288s_{15}s_{32} - 288s_{16}s_{31} - 576s_{17}s_{30} - 1152s_{18}s_{29} -$
 $1152s_{19}s_{28} + 1728s_{20}s_{27} - 576s_{0}s_{48} - 1152s_{1}s_{47} - 864s_{2}s_{46} - 1152s_{3}s_{45} - 864s_{4}s_{44} - 288s_{5}s_{43} - 576s_{6}s_{42} -$
 $576s_{7}s_{41} - 576s_{8}s_{40} - 5272704s_{9}s_{39} - 576s_{10}s_{38} - 1152s_{11}s_{37} - 864s_{12}s_{36} - 1152s_{13}s_{35} - 864s_{14}s_{34} - 288s_{15}s_{33} -$
 $576s_{16}s_{32} - 576s_{17}s_{31} - 576s_{18}s_{30} - 864s_{19}s_{29} - 576s_{0}s_{49} - 864s_{1}s_{48} - 864s_{2}s_{47} - 864s_{3}s_{46} - 1152s_{4}s_{45} -$
 $576s_{5}s_{44} - 576s_{6}s_{43} - 576s_{7}s_{42} - 576s_{8}s_{41} - 288s_{9}s_{40} - 576s_{10}s_{39} - 864s_{11}s_{38} - 864s_{12}s_{37} - 864s_{13}s_{36} -$
 $1152s_{14}s_{35} - 576s_{15}s_{34} - 576s_{16}s_{33} - 576s_{17}s_{32} - 576s_{18}s_{31} - 288s_{19}s_{30} + 1728s_{20}s_{29} - 288s_{0}s_{50} - 864s_{1}s_{49} -$
 $1152s_{2}s_{48} - 1152s_{3}s_{47} - 1152s_{4}s_{46} - 576s_{5}s_{45} - 1152s_{6}s_{44} - 288s_{7}s_{43} - 288s_{8}s_{42} - 576s_{9}s_{41} - 5272704s_{10}s_{40} -$
 $864s_{11}s_{39} - 1152s_{12}s_{38} - 1152s_{13}s_{37} - 1152s_{14}s_{36} - 576s_{15}s_{35} - 1152s_{16}s_{34} - 288s_{17}s_{33} - 288s_{18}s_{32} - 576s_{19}s_{31} +$
 $576s_{20}s_{30} + 1728s_{21}s_{29} - 288s_{0}s_{51} - 576s_{1}s_{50} - 1152s_{2}s_{49} - 864s_{3}s_{48} - 864s_{4}s_{47} - 576s_{5}s_{46} - 864s_{6}s_{45} -$
 $1152s_{7}s_{44} - 576s_{8}s_{43} - 576s_{9}s_{42} - 5272704s_{10}s_{41} - 5272704s_{11}s_{40} - 1152s_{12}s_{39} - 864s_{13}s_{38} - 864s_{14}s_{37} -$
 $576s_{15}s_{36} - 864s_{16}s_{35} - 1152s_{17}s_{34} - 576s_{18}s_{33} - 576s_{19}s_{32} - 288s_{0}s_{52} - 288s_{1}s_{51} - 576s_{2}s_{50} - 1152s_{3}s_{49} -$
 $1152s_{4}s_{48} - 576s_{5}s_{47} - 1152s_{6}s_{46} - 864s_{7}s_{45} - 864s_{8}s_{44} - 576s_{9}s_{43} - 5272704s_{10}s_{42} - 864s_{12}s_{40} - 1152s_{13}s_{39} -$
 $1152s_{14}s_{38} - 576s_{15}s_{37} - 1152s_{16}s_{36} - 864s_{17}s_{35} - 864s_{18}s_{34} - 576s_{19}s_{33} + 576s_{21}s_{31} - 288s_{0}s_{53} - 576s_{1}s_{52} -$
 $576s_{2}s_{51} - 576s_{3}s_{50} - 864s_{4}s_{49} - 576s_{5}s_{48} - 1152s_{6}s_{47} - 864s_{7}s_{46} - 1152s_{8}s_{45} - 864s_{9}s_{44} - 5272704s_{10}s_{43} -$
 $5272704s_{12}s_{41} - 1728s_{13}s_{40} - 864s_{14}s_{39} - 576s_{15}s_{38} - 1152s_{16}s_{37} - 864s_{17}s_{36} - 1152s_{18}s_{35} - 864s_{19}s_{34} +$
 $1728s_{24}s_{29} - 576s_{0}s_{54} - 576s_{1}s_{53} - 576s_{2}s_{52} - 576s_{3}s_{51} - 288s_{4}s_{50} - 576s_{5}s_{49} - 864s_{6}s_{48} - 864s_{7}s_{47} - 864s_{8}s_{46} -$
 $1152s_{9}s_{45} - 1728s_{13}s_{41} - 864s_{14}s_{40} - 576s_{15}s_{39} - 864s_{16}s_{38} - 864s_{17}s_{37} - 864s_{18}s_{36} - 1152s_{19}s_{35} + 576s_{20}s_{34} +$
 $576s_{22}s_{32} + 576s_{24}s_{30} - 576s_{0}s_{55} - 1152s_{1}s_{54} - 288s_{2}s_{53} - 288s_{3}s_{52} - 576s_{4}s_{51} - 288s_{5}s_{50} - 864s_{6}s_{49} -$
 $1152s_{7}s_{48} - 1152s_{8}s_{47} - 1152s_{9}s_{46} - 5272704s_{11}s_{44} - 5272704s_{13}s_{42} - 864s_{14}s_{41} - 288s_{15}s_{40} - 864s_{16}s_{39} -$
 $1152s_{17}s_{38} - 1152s_{18}s_{37} - 1152s_{19}s_{36} - 576s_{0}s_{56} - 864s_{1}s_{55} - 1152s_{2}s_{54} - 576s_{3}s_{53} - 576s_{4}s_{52} - 288s_{5}s_{51} -$
 $576s_{6}s_{50} - 1152s_{7}s_{49} - 864s_{8}s_{48} - 864s_{9}s_{47} - 5272704s_{11}s_{45} - 5272704s_{12}s_{44} - 1728s_{14}s_{42} - 288s_{15}s_{41} -$
 $576s_{16}s_{40} - 1152s_{17}s_{39} - 864s_{18}s_{38} - 864s_{19}s_{37} + 576s_{21}s_{35} + 576s_{22}s_{34} + 576s_{23}s_{33} + 576s_{24}s_{32} + 576s_{25}s_{31} -$
 $576s_{0}s_{57} - 1152s_{1}s_{56} - 864s_{2}s_{55} - 864s_{3}s_{54} - 576s_{4}s_{53} - 288s_{5}s_{52} - 288s_{6}s_{51} - 576s_{7}s_{50} - 1152s_{8}s_{49} -$
 $1152s_{9}s_{48} - 5272704s_{11}s_{46} - 1728s_{13}s_{44} - 5272704s_{14}s_{43} - 288s_{15}s_{42} - 288s_{16}s_{41} - 576s_{17}s_{40} - 1152s_{18}s_{39} -$
 $1152s_{19}s_{38} + 576s_{20}s_{37} + 576s_{27}s_{30} - 576s_{0}s_{58} - 1152s_{1}s_{57} - 864s_{2}s_{56} - 1152s_{3}s_{55} - 864s_{4}s_{54} - 288s_{5}s_{53} -$
 $576s_{6}s_{52} - 576s_{7}s_{51} - 576s_{8}s_{50} - 864s_{9}s_{49} - 5272704s_{13}s_{45} - 864s_{14}s_{44} - 288s_{15}s_{43} - 576s_{16}s_{42} - 576s_{17}s_{41} -$
 $576s_{18}s_{40} - 864s_{19}s_{39} + 576s_{22}s_{36} + 576s_{23}s_{35} + 1152s_{24}s_{34} + 576s_{25}s_{33} + 576s_{26}s_{32} - 576s_{0}s_{59} - 864s_{1}s_{58} -$
 $864s_{2}s_{57} - 864s_{3}s_{56} - 1152s_{4}s_{55} - 576s_{5}s_{54} - 576s_{6}s_{53} - 576s_{7}s_{52} - 576s_{8}s_{51} - 288s_{9}s_{50} - 5272704s_{12}s_{47} -$
 $1728s_{14}s_{45} - 576s_{15}s_{44} - 576s_{16}s_{43} - 576s_{17}s_{42} - 576s_{18}s_{41} - 288s_{19}s_{40} + 576s_{20}s_{39} + 576s_{21}s_{38} + 576s_{23}s_{36} +$
 $576s_{26}s_{33} + 576s_{28}s_{31} + 576s_{29}s_{30} - 864s_{1}s_{59} - 1152s_{2}s_{58} - 1152s_{3}s_{57} - 1152s_{4}s_{56} - 576s_{5}s_{55} - 1152s_{6}s_{54} -$
 $288s_{7}s_{53} - 288s_{8}s_{52} - 576s_{9}s_{51} - 288s_{10}s_{50} - 5272704s_{12}s_{48} - 5272704s_{13}s_{47} - 5272704s_{14}s_{46} - 576s_{15}s_{45} -$
 $1152s_{16}s_{44} - 288s_{17}s_{43} - 288s_{18}s_{42} - 576s_{19}s_{41} + 576s_{20}s_{40} + 576s_{21}s_{39} + 576s_{22}s_{38} + 576s_{23}s_{37} + 576s_{24}s_{36} +$
 $1152s_{25}s_{35} + 576s_{26}s_{34} + 576s_{27}s_{33} + 576s_{28}s_{32} + 576s_{29}s_{31} - 1152s_{2}s_{59} - 864s_{3}s_{58} - 864s_{4}s_{57} - 576s_{5}s_{56} -$
 $864s_{6}s_{55} - 1152s_{7}s_{54} - 576s_{8}s_{53} - 576s_{9}s_{52} - 288s_{10}s_{51} - 576s_{11}s_{50} - 1728s_{14}s_{47} - 576s_{15}s_{46} - 864s_{16}s_{45} -$

$$\begin{aligned}
& 1152s_{17}s_{44} - 576s_{18}s_{43} - 576s_{19}s_{42} + 576s_{24}s_{37} + 576s_{25}s_{36} + 576s_{26}s_{35} + 576s_{27}s_{34} - 1152s_{35}s_{59} - 1152s_{45}s_{58} - \\
& 576s_{55}s_{57} - 1152s_{65}s_{56} - 864s_{75}s_{55} - 864s_{85}s_{54} - 576s_{95}s_{53} - 288s_{105}s_{52} - 288s_{115}s_{51} - 576s_{125}s_{50} - 5272704s_{13}s_{49} - \\
& 5272704s_{14}s_{48} - 576s_{15}s_{47} - 1152s_{16}s_{46} - 864s_{17}s_{45} - 864s_{18}s_{44} - 576s_{19}s_{43} + 576s_{21}s_{41} + 576s_{24}s_{38} + \\
& 576s_{25}s_{37} + 1152s_{26}s_{36} + 576s_{27}s_{35} + 576s_{28}s_{34} - 864s_{45}s_{59} - 576s_{55}s_{58} - 1152s_{65}s_{57} - 864s_{75}s_{56} - 1152s_{85}s_{55} - \\
& 864s_{95}s_{54} - 288s_{105}s_{53} - 576s_{115}s_{52} - 576s_{125}s_{51} - 576s_{135}s_{50} - 5272704s_{14}s_{49} - 576s_{15}s_{48} - 1152s_{16}s_{47} - \\
& 864s_{17}s_{46} - 1152s_{18}s_{45} - 864s_{19}s_{44} + 576s_{24}s_{39} + 576s_{25}s_{38} + 576s_{26}s_{37} + 576s_{27}s_{36} + 576s_{28}s_{35} + 576s_{29}s_{34} - \\
& 576s_{55}s_{59} - 864s_{65}s_{58} - 864s_{75}s_{57} - 864s_{85}s_{56} - 1152s_{95}s_{55} - 576s_{105}s_{54} - 576s_{115}s_{53} - 576s_{125}s_{52} - 576s_{135}s_{51} - \\
& 288s_{145}s_{50} - 576s_{155}s_{49} - 864s_{165}s_{48} - 864s_{175}s_{47} - 864s_{185}s_{46} - 1152s_{195}s_{45} + 576s_{205}s_{44} + 576s_{22}s_{42} + 576s_{24}s_{40} + \\
& 576s_{25}s_{39} + 576s_{26}s_{38} + 1152s_{27}s_{37} + 576s_{28}s_{36} + 576s_{29}s_{35} - 864s_{65}s_{59} - 1152s_{75}s_{58} - 1152s_{85}s_{57} - 1152s_{95}s_{56} - \\
& 576s_{105}s_{55} - 1152s_{115}s_{54} - 288s_{125}s_{53} - 288s_{135}s_{52} - 576s_{145}s_{51} - 5272704s_{15}s_{50} - 864s_{165}s_{49} - 1152s_{175}s_{48} - \\
& 1152s_{185}s_{47} - 1152s_{195}s_{46} - 1152s_{75}s_{59} - 864s_{85}s_{58} - 864s_{95}s_{57} - 576s_{105}s_{56} - 864s_{115}s_{55} - 1152s_{125}s_{54} - 576s_{135}s_{53} - \\
& 576s_{145}s_{52} - 5272704s_{15}s_{51} - 5272704s_{16}s_{50} - 1152s_{175}s_{49} - 864s_{185}s_{48} - 864s_{195}s_{47} + 576s_{21}s_{45} + 576s_{22}s_{44} + \\
& 576s_{23}s_{43} + 576s_{24}s_{42} + 576s_{25}s_{41} + 576s_{27}s_{39} + 1152s_{28}s_{38} + 576s_{29}s_{37} - 1152s_{85}s_{59} - 1152s_{95}s_{58} - 576s_{105}s_{57} - \\
& 1152s_{115}s_{56} - 864s_{125}s_{55} - 864s_{135}s_{54} - 576s_{145}s_{53} - 5272704s_{15}s_{52} - 864s_{175}s_{50} - 1152s_{185}s_{49} - 1152s_{195}s_{48} + \\
& 576s_{205}s_{47} + 576s_{27}s_{40} + 576s_{28}s_{39} + 576s_{29}s_{38} + 1728s_{30}s_{37} - 864s_{95}s_{59} - 576s_{105}s_{58} - 1152s_{115}s_{57} - 864s_{125}s_{56} - \\
& 1152s_{135}s_{55} - 864s_{145}s_{54} - 5272704s_{15}s_{53} - 5272704s_{175}s_{51} - 1728s_{185}s_{50} - 864s_{195}s_{49} + 576s_{22}s_{46} + 576s_{23}s_{45} + \\
& 1152s_{24}s_{44} + 576s_{25}s_{43} + 576s_{26}s_{42} + 1152s_{29}s_{39} - 576s_{105}s_{59} - 864s_{115}s_{58} - 864s_{125}s_{57} - 864s_{135}s_{56} - 1152s_{145}s_{55} - \\
& 1728s_{185}s_{51} - 864s_{195}s_{50} + 576s_{205}s_{49} + 576s_{21}s_{48} + 576s_{23}s_{46} + 576s_{26}s_{43} + 576s_{28}s_{41} + 576s_{29}s_{40} + 1728s_{30}s_{39} - \\
& 864s_{115}s_{59} - 1152s_{125}s_{58} - 1152s_{135}s_{57} - 1152s_{145}s_{56} - 5272704s_{16}s_{54} - 5272704s_{185}s_{52} - 864s_{195}s_{51} + 576s_{205}s_{50} + \\
& 576s_{21}s_{49} + 576s_{22}s_{48} + 576s_{23}s_{47} + 576s_{24}s_{46} + 1152s_{25}s_{45} + 576s_{26}s_{44} + 576s_{27}s_{43} + 576s_{28}s_{42} + 576s_{29}s_{41} + \\
& 576s_{30}s_{40} + 1728s_{31}s_{39} - 1152s_{125}s_{59} - 864s_{135}s_{58} - 864s_{145}s_{57} - 5272704s_{16}s_{55} - 5272704s_{175}s_{54} - 1728s_{195}s_{52} + \\
& 576s_{24}s_{47} + 576s_{25}s_{46} + 576s_{26}s_{45} + 576s_{27}s_{44} - 1152s_{135}s_{59} - 1152s_{145}s_{58} - 5272704s_{16}s_{56} - 1728s_{185}s_{54} - \\
& 5272704s_{195}s_{53} + 576s_{21}s_{51} + 576s_{24}s_{48} + 576s_{25}s_{47} + 1152s_{26}s_{46} + 576s_{27}s_{45} + 576s_{28}s_{44} + 576s_{31}s_{41} - 864s_{145}s_{59} - \\
& 5272704s_{185}s_{55} - 864s_{195}s_{54} + 576s_{24}s_{49} + 576s_{25}s_{48} + 576s_{26}s_{47} + 576s_{27}s_{46} + 576s_{28}s_{45} + 576s_{29}s_{44} + 1728s_{34}s_{39} - \\
& 5272704s_{175}s_{57} - 1728s_{195}s_{55} + 576s_{205}s_{54} + 576s_{22}s_{52} + 576s_{24}s_{50} + 576s_{25}s_{49} + 576s_{26}s_{48} + 1152s_{27}s_{47} + \\
& 576s_{28}s_{46} + 576s_{29}s_{45} + 576s_{30}s_{44} + 576s_{32}s_{42} + 576s_{34}s_{40} - 5272704s_{175}s_{58} - 5272704s_{185}s_{57} - 5272704s_{195}s_{56} - \\
& 1728s_{195}s_{57} + 576s_{21}s_{55} + 576s_{22}s_{54} + 576s_{23}s_{53} + 576s_{24}s_{52} + 576s_{25}s_{51} + 576s_{27}s_{49} + 1152s_{28}s_{48} + 576s_{29}s_{47} + \\
& 576s_{31}s_{45} + 576s_{32}s_{44} + 576s_{33}s_{43} + 576s_{34}s_{42} + 576s_{35}s_{41} - 5272704s_{185}s_{59} - 5272704s_{195}s_{58} + 576s_{205}s_{57} + \\
& 576s_{27}s_{50} + 576s_{28}s_{49} + 576s_{29}s_{48} + 576s_{30}s_{47} + 576s_{37}s_{40} - 5272704s_{195}s_{59} + 576s_{22}s_{56} + 576s_{23}s_{55} + 1152s_{24}s_{54} + \\
& 576s_{25}s_{53} + 576s_{26}s_{52} + 1152s_{29}s_{49} + 576s_{32}s_{46} + 576s_{33}s_{45} + 1152s_{34}s_{44} + 576s_{35}s_{43} + 576s_{36}s_{42} + 576s_{205}s_{59} + \\
& 576s_{21}s_{58} + 576s_{23}s_{56} + 576s_{26}s_{53} + 576s_{28}s_{51} + 576s_{29}s_{50} + 576s_{30}s_{49} + 576s_{31}s_{48} + 576s_{33}s_{46} + 576s_{36}s_{43} + \\
& 576s_{38}s_{41} + 576s_{39}s_{40} + 576s_{21}s_{59} + 576s_{22}s_{58} + 576s_{23}s_{57} + 576s_{24}s_{56} + 1152s_{25}s_{55} + 576s_{26}s_{54} + 576s_{27}s_{53} + \\
& 576s_{28}s_{52} + 576s_{29}s_{51} + 576s_{30}s_{50} + 576s_{31}s_{49} + 576s_{32}s_{48} + 576s_{33}s_{47} + 576s_{34}s_{46} + 1152s_{35}s_{45} + 576s_{36}s_{44} + \\
& 576s_{37}s_{43} + 576s_{38}s_{42} + 576s_{39}s_{41} + 576s_{24}s_{57} + 576s_{25}s_{56} + 576s_{26}s_{55} + 576s_{27}s_{54} + 576s_{34}s_{47} + 576s_{35}s_{46} + \\
& 576s_{36}s_{45} + 576s_{37}s_{44} + 576s_{24}s_{58} + 576s_{25}s_{57} + 1152s_{26}s_{56} + 576s_{27}s_{55} + 576s_{28}s_{54} + 576s_{31}s_{51} + 576s_{34}s_{48} + \\
& 576s_{35}s_{47} + 1152s_{36}s_{46} + 576s_{37}s_{45} + 576s_{38}s_{44} + 576s_{24}s_{59} + 576s_{25}s_{58} + 576s_{26}s_{57} + 576s_{27}s_{56} + 576s_{28}s_{55} + \\
& 576s_{29}s_{54} + 576s_{34}s_{49} + 576s_{35}s_{48} + 576s_{36}s_{47} + 576s_{37}s_{46} + 576s_{38}s_{45} + 576s_{39}s_{44} + 576s_{25}s_{59} + 576s_{26}s_{58} + \\
& 1152s_{27}s_{57} + 576s_{28}s_{56} + 576s_{29}s_{55} + 576s_{30}s_{54} + 576s_{32}s_{52} + 576s_{34}s_{50} + 576s_{35}s_{49} + 576s_{36}s_{48} + 1152s_{37}s_{47} + \\
& 576s_{38}s_{46} + 576s_{39}s_{45} + 576s_{27}s_{59} + 1152s_{28}s_{58} + 576s_{29}s_{57} + 576s_{31}s_{55} + 576s_{32}s_{54} + 576s_{33}s_{53} + 576s_{34}s_{52} + \\
& 576s_{35}s_{51} + 576s_{37}s_{49} + 1152s_{38}s_{48} + 576s_{39}s_{47} + 576s_{28}s_{59} + 576s_{29}s_{58} + 576s_{30}s_{57} + 576s_{37}s_{50} + 576s_{38}s_{49} + \\
& 576s_{39}s_{48} + 1728s_{40}s_{47} + 1152s_{29}s_{59} + 576s_{32}s_{56} + 576s_{33}s_{55} + 1152s_{34}s_{54} + 576s_{35}s_{53} + 576s_{36}s_{52} + 1152s_{39}s_{49} + \\
& 576s_{30}s_{59} + 576s_{31}s_{58} + 576s_{33}s_{56} + 576s_{36}s_{53} + 576s_{38}s_{51} + 576s_{39}s_{50} + 1728s_{40}s_{49} + 576s_{31}s_{59} + 576s_{32}s_{58} + \\
& 576s_{33}s_{57} + 576s_{34}s_{56} + 1152s_{35}s_{55} + 576s_{36}s_{54} + 576s_{37}s_{53} + 576s_{38}s_{52} + 576s_{39}s_{51} + 576s_{40}s_{50} + 1728s_{41}s_{49} + \\
& 576s_{34}s_{57} + 576s_{35}s_{56} + 576s_{36}s_{55} + 576s_{37}s_{54} + 576s_{34}s_{58} + 576s_{35}s_{57} + 1152s_{36}s_{56} + 576s_{37}s_{55} + 576s_{38}s_{54} + \\
& 576s_{41}s_{51} + 576s_{34}s_{59} + 576s_{35}s_{58} + 576s_{36}s_{57} + 576s_{37}s_{56} + 576s_{38}s_{55} + 576s_{39}s_{54} + 1728s_{44}s_{49} + 576s_{35}s_{59} + \\
& 576s_{36}s_{58} + 1152s_{37}s_{57} + 576s_{38}s_{56} + 576s_{39}s_{55} + 576s_{40}s_{54} + 576s_{42}s_{52} + 576s_{44}s_{50} + 576s_{37}s_{59} + 1152s_{38}s_{58} + \\
& 576s_{39}s_{57} + 576s_{41}s_{55} + 576s_{42}s_{54} + 576s_{43}s_{53} + 576s_{44}s_{52} + 576s_{45}s_{51} + 576s_{38}s_{59} + 576s_{39}s_{58} + 576s_{40}s_{57} + \\
& 576s_{47}s_{50} + 1152s_{39}s_{59} + 576s_{42}s_{56} + 576s_{43}s_{55} + 1152s_{44}s_{54} + 576s_{45}s_{53} + 576s_{46}s_{52} + 576s_{40}s_{59} + 576s_{41}s_{58} +
\end{aligned}$$

$$\begin{aligned}
& 576s_{43}s_{56} + 576s_{46}s_{53} + 576s_{48}s_{51} + 576s_{49}s_{50} + 576s_{41}s_{59} + 576s_{42}s_{58} + 576s_{43}s_{57} + 576s_{44}s_{56} + 1152s_{45}s_{55} + \\
& 576s_{46}s_{54} + 576s_{47}s_{53} + 576s_{48}s_{52} + 576s_{49}s_{51} + 576s_{44}s_{57} + 576s_{45}s_{56} + 576s_{46}s_{55} + 576s_{47}s_{54} + 576s_{44}s_{58} + \\
& 576s_{45}s_{57} + 1152s_{46}s_{56} + 576s_{47}s_{55} + 576s_{48}s_{54} + 576s_{44}s_{59} + 576s_{45}s_{58} + 576s_{46}s_{57} + 576s_{47}s_{56} + 576s_{48}s_{55} + \\
& 576s_{49}s_{54} + 576s_{45}s_{59} + 576s_{46}s_{58} + 1152s_{47}s_{57} + 576s_{48}s_{56} + 576s_{49}s_{55} + 576s_{47}s_{59} + 1152s_{48}s_{58} + 576s_{49}s_{57} + \\
& 576s_{48}s_{59} + 576s_{49}s_{58} + 1728s_{50}s_{57} + 1152s_{49}s_{59} + 1728s_{50}s_{59} + 1728s_{51}s_{59} + 1728s_{54}s_{59} + 316483200
\end{aligned}$$

A complete expression of $\hat{H}_2(\hat{\sigma}^z)$ for 36-order Williamson based method or 108-order Baumert-Hall based method

$$\begin{aligned}
\hat{H}_2(\hat{\sigma}^z) = & 10555200\hat{\sigma}_0^z + 10561680\hat{\sigma}_1^z + 10562544\hat{\sigma}_2^z + 10566864\hat{\sigma}_3^z + 10569456\hat{\sigma}_4^z + 10555200\hat{\sigma}_5^z + \\
& 10561680\hat{\sigma}_6^z + 10562544\hat{\sigma}_7^z + 10566864\hat{\sigma}_8^z + 10569456\hat{\sigma}_9^z + 10555200\hat{\sigma}_{10}^z + 10561680\hat{\sigma}_{11}^z + 10562544\hat{\sigma}_{12}^z + \\
& 10566864\hat{\sigma}_{13}^z + 10569456\hat{\sigma}_{14}^z + 10555200\hat{\sigma}_{15}^z + 10561680\hat{\sigma}_{16}^z + 10562544\hat{\sigma}_{17}^z + 10566864\hat{\sigma}_{18}^z + 10569456\hat{\sigma}_{19}^z - \\
& 5278752\hat{\sigma}_{20}^z - 5277888\hat{\sigma}_{21}^z - 5277600\hat{\sigma}_{22}^z - 5278752\hat{\sigma}_{23}^z - 5282208\hat{\sigma}_{24}^z - 5281920\hat{\sigma}_{25}^z - 5283072\hat{\sigma}_{26}^z - \\
& 5283648\hat{\sigma}_{27}^z - 5283072\hat{\sigma}_{28}^z - 5288832\hat{\sigma}_{29}^z - 5278752\hat{\sigma}_{30}^z - 5277888\hat{\sigma}_{31}^z - 5277600\hat{\sigma}_{32}^z - 5278752\hat{\sigma}_{33}^z - \\
& 5282208\hat{\sigma}_{34}^z - 5281920\hat{\sigma}_{35}^z - 5283072\hat{\sigma}_{36}^z - 5283648\hat{\sigma}_{37}^z - 5283072\hat{\sigma}_{38}^z - 5288832\hat{\sigma}_{39}^z - 5278752\hat{\sigma}_{40}^z - \\
& 5277888\hat{\sigma}_{41}^z - 5277600\hat{\sigma}_{42}^z - 5278752\hat{\sigma}_{43}^z - 5282208\hat{\sigma}_{44}^z - 5281920\hat{\sigma}_{45}^z - 5283072\hat{\sigma}_{46}^z - 5283648\hat{\sigma}_{47}^z - \\
& 5283072\hat{\sigma}_{48}^z - 5288832\hat{\sigma}_{49}^z - 5278752\hat{\sigma}_{50}^z - 5277888\hat{\sigma}_{51}^z - 5277600\hat{\sigma}_{52}^z - 5278752\hat{\sigma}_{53}^z - 5282208\hat{\sigma}_{54}^z - \\
& 5281920\hat{\sigma}_{55}^z - 5283072\hat{\sigma}_{56}^z - 5283648\hat{\sigma}_{57}^z - 5283072\hat{\sigma}_{58}^z - 5288832\hat{\sigma}_{59}^z + 2636352\hat{\sigma}_0^z\hat{\sigma}_1^z + 2636352\hat{\sigma}_0^z\hat{\sigma}_2^z + \\
& 2636352\hat{\sigma}_0^z\hat{\sigma}_3^z + 2636352\hat{\sigma}_1^z\hat{\sigma}_2^z + 2636352\hat{\sigma}_1^z\hat{\sigma}_4^z + 2636352\hat{\sigma}_1^z\hat{\sigma}_5^z + 2636352\hat{\sigma}_1^z\hat{\sigma}_6^z + 2636352\hat{\sigma}_1^z\hat{\sigma}_7^z + \\
& 1008\hat{\sigma}_0^z\hat{\sigma}_6^z + 1008\hat{\sigma}_1^z\hat{\sigma}_5^z + 2636352\hat{\sigma}_2^z\hat{\sigma}_4^z + 1008\hat{\sigma}_0^z\hat{\sigma}_7^z + 1872\hat{\sigma}_1^z\hat{\sigma}_6^z + 1008\hat{\sigma}_2^z\hat{\sigma}_5^z + 2636352\hat{\sigma}_3^z\hat{\sigma}_4^z + 1008\hat{\sigma}_0^z\hat{\sigma}_8^z + \\
& 1728\hat{\sigma}_1^z\hat{\sigma}_7^z + 1728\hat{\sigma}_2^z\hat{\sigma}_6^z + 1008\hat{\sigma}_3^z\hat{\sigma}_5^z + 1008\hat{\sigma}_0^z\hat{\sigma}_9^z + 1728\hat{\sigma}_1^z\hat{\sigma}_8^z + 1872\hat{\sigma}_2^z\hat{\sigma}_7^z + 1728\hat{\sigma}_3^z\hat{\sigma}_6^z + 1008\hat{\sigma}_4^z\hat{\sigma}_5^z + 576\hat{\sigma}_0^z\hat{\sigma}_{10}^z + \\
& 1728\hat{\sigma}_1^z\hat{\sigma}_9^z + 1728\hat{\sigma}_2^z\hat{\sigma}_8^z + 1728\hat{\sigma}_3^z\hat{\sigma}_7^z + 1728\hat{\sigma}_4^z\hat{\sigma}_6^z + 1008\hat{\sigma}_0^z\hat{\sigma}_{11}^z + 1008\hat{\sigma}_1^z\hat{\sigma}_{10}^z + 1728\hat{\sigma}_2^z\hat{\sigma}_9^z + 1872\hat{\sigma}_3^z\hat{\sigma}_8^z + \\
& 1728\hat{\sigma}_4^z\hat{\sigma}_7^z + 2636352\hat{\sigma}_5^z\hat{\sigma}_6^z + 1008\hat{\sigma}_0^z\hat{\sigma}_{12}^z + 1872\hat{\sigma}_1^z\hat{\sigma}_{11}^z + 1008\hat{\sigma}_2^z\hat{\sigma}_{10}^z + 1728\hat{\sigma}_3^z\hat{\sigma}_9^z + 1728\hat{\sigma}_4^z\hat{\sigma}_8^z + 2636352\hat{\sigma}_5^z\hat{\sigma}_7^z + \\
& 1008\hat{\sigma}_0^z\hat{\sigma}_{13}^z + 1728\hat{\sigma}_1^z\hat{\sigma}_{12}^z + 1728\hat{\sigma}_2^z\hat{\sigma}_{11}^z + 1008\hat{\sigma}_3^z\hat{\sigma}_{10}^z + 1872\hat{\sigma}_4^z\hat{\sigma}_9^z + 2636352\hat{\sigma}_5^z\hat{\sigma}_8^z + 2636352\hat{\sigma}_6^z\hat{\sigma}_7^z + 1008\hat{\sigma}_0^z\hat{\sigma}_{14}^z + \\
& 1728\hat{\sigma}_1^z\hat{\sigma}_{13}^z + 1872\hat{\sigma}_2^z\hat{\sigma}_{12}^z + 1728\hat{\sigma}_3^z\hat{\sigma}_{11}^z + 1008\hat{\sigma}_4^z\hat{\sigma}_{10}^z + 2636352\hat{\sigma}_5^z\hat{\sigma}_9^z + 2636352\hat{\sigma}_6^z\hat{\sigma}_8^z + 576\hat{\sigma}_0^z\hat{\sigma}_{15}^z + 1728\hat{\sigma}_1^z\hat{\sigma}_{14}^z + \\
& 1728\hat{\sigma}_2^z\hat{\sigma}_{13}^z + 1728\hat{\sigma}_3^z\hat{\sigma}_{12}^z + 1728\hat{\sigma}_4^z\hat{\sigma}_{11}^z + 576\hat{\sigma}_5^z\hat{\sigma}_{10}^z + 2636352\hat{\sigma}_6^z\hat{\sigma}_9^z + 2636352\hat{\sigma}_7^z\hat{\sigma}_8^z + 1008\hat{\sigma}_0^z\hat{\sigma}_{16}^z + 1008\hat{\sigma}_1^z\hat{\sigma}_{15}^z + \\
& 1728\hat{\sigma}_2^z\hat{\sigma}_{14}^z + 1872\hat{\sigma}_3^z\hat{\sigma}_{13}^z + 1728\hat{\sigma}_4^z\hat{\sigma}_{12}^z + 1008\hat{\sigma}_5^z\hat{\sigma}_{11}^z + 1008\hat{\sigma}_6^z\hat{\sigma}_{10}^z + 2636352\hat{\sigma}_7^z\hat{\sigma}_9^z + 1008\hat{\sigma}_0^z\hat{\sigma}_{17}^z + 1872\hat{\sigma}_1^z\hat{\sigma}_{16}^z + \\
& 1008\hat{\sigma}_2^z\hat{\sigma}_{15}^z + 1728\hat{\sigma}_3^z\hat{\sigma}_{14}^z + 1728\hat{\sigma}_4^z\hat{\sigma}_{13}^z + 1008\hat{\sigma}_5^z\hat{\sigma}_{12}^z + 1872\hat{\sigma}_6^z\hat{\sigma}_{11}^z + 1008\hat{\sigma}_7^z\hat{\sigma}_{10}^z + 2636352\hat{\sigma}_8^z\hat{\sigma}_9^z + 1008\hat{\sigma}_0^z\hat{\sigma}_{18}^z + \\
& 1728\hat{\sigma}_1^z\hat{\sigma}_{17}^z + 1728\hat{\sigma}_2^z\hat{\sigma}_{16}^z + 1008\hat{\sigma}_3^z\hat{\sigma}_{15}^z + 1872\hat{\sigma}_4^z\hat{\sigma}_{14}^z + 1008\hat{\sigma}_5^z\hat{\sigma}_{13}^z + 1728\hat{\sigma}_6^z\hat{\sigma}_{12}^z + 1728\hat{\sigma}_7^z\hat{\sigma}_{11}^z + 1008\hat{\sigma}_8^z\hat{\sigma}_{10}^z + \\
& 1008\hat{\sigma}_0^z\hat{\sigma}_{19}^z + 1728\hat{\sigma}_1^z\hat{\sigma}_{18}^z + 1872\hat{\sigma}_2^z\hat{\sigma}_{17}^z + 1728\hat{\sigma}_3^z\hat{\sigma}_{16}^z + 1008\hat{\sigma}_4^z\hat{\sigma}_{15}^z + 1008\hat{\sigma}_5^z\hat{\sigma}_{14}^z + 1728\hat{\sigma}_6^z\hat{\sigma}_{13}^z + 1872\hat{\sigma}_7^z\hat{\sigma}_{12}^z + \\
& 1728\hat{\sigma}_8^z\hat{\sigma}_{11}^z + 1008\hat{\sigma}_9^z\hat{\sigma}_{10}^z - 5272704\hat{\sigma}_0^z\hat{\sigma}_{20}^z + 1728\hat{\sigma}_1^z\hat{\sigma}_{19}^z + 1728\hat{\sigma}_2^z\hat{\sigma}_{18}^z + 1728\hat{\sigma}_3^z\hat{\sigma}_{17}^z + 1728\hat{\sigma}_4^z\hat{\sigma}_{16}^z + 576\hat{\sigma}_5^z\hat{\sigma}_{15}^z + \\
& 1728\hat{\sigma}_6^z\hat{\sigma}_{14}^z + 1728\hat{\sigma}_7^z\hat{\sigma}_{13}^z + 1728\hat{\sigma}_8^z\hat{\sigma}_{12}^z + 1728\hat{\sigma}_9^z\hat{\sigma}_{11}^z - 5272704\hat{\sigma}_0^z\hat{\sigma}_{21}^z - 5272704\hat{\sigma}_1^z\hat{\sigma}_{20}^z + 1728\hat{\sigma}_2^z\hat{\sigma}_{19}^z + \\
& 1872\hat{\sigma}_3^z\hat{\sigma}_{18}^z + 1728\hat{\sigma}_4^z\hat{\sigma}_{17}^z + 1008\hat{\sigma}_5^z\hat{\sigma}_{16}^z + 1008\hat{\sigma}_6^z\hat{\sigma}_{15}^z + 1728\hat{\sigma}_7^z\hat{\sigma}_{14}^z + 1872\hat{\sigma}_8^z\hat{\sigma}_{13}^z + 1728\hat{\sigma}_9^z\hat{\sigma}_{12}^z + 2636352\hat{\sigma}_{10}^z\hat{\sigma}_{11}^z - \\
& 5272704\hat{\sigma}_0^z\hat{\sigma}_{22}^z - 864\hat{\sigma}_2^z\hat{\sigma}_{20}^z + 1728\hat{\sigma}_3^z\hat{\sigma}_{19}^z + 1728\hat{\sigma}_4^z\hat{\sigma}_{18}^z + 1008\hat{\sigma}_5^z\hat{\sigma}_{17}^z + 1872\hat{\sigma}_6^z\hat{\sigma}_{16}^z + 1008\hat{\sigma}_7^z\hat{\sigma}_{15}^z + 1728\hat{\sigma}_8^z\hat{\sigma}_{14}^z + \\
& 1728\hat{\sigma}_9^z\hat{\sigma}_{13}^z + 2636352\hat{\sigma}_{10}^z\hat{\sigma}_{12}^z - 5272704\hat{\sigma}_0^z\hat{\sigma}_{23}^z - 5272704\hat{\sigma}_2^z\hat{\sigma}_{21}^z - 1728\hat{\sigma}_3^z\hat{\sigma}_{20}^z + 1872\hat{\sigma}_4^z\hat{\sigma}_{19}^z + 1008\hat{\sigma}_5^z\hat{\sigma}_{18}^z + \\
& 1728\hat{\sigma}_6^z\hat{\sigma}_{17}^z + 1728\hat{\sigma}_7^z\hat{\sigma}_{16}^z + 1008\hat{\sigma}_8^z\hat{\sigma}_{15}^z + 1872\hat{\sigma}_9^z\hat{\sigma}_{14}^z + 2636352\hat{\sigma}_{10}^z\hat{\sigma}_{13}^z + 2636352\hat{\sigma}_{11}^z\hat{\sigma}_{12}^z - 1728\hat{\sigma}_3^z\hat{\sigma}_{21}^z - \\
& 864\hat{\sigma}_4^z\hat{\sigma}_{20}^z + 1008\hat{\sigma}_5^z\hat{\sigma}_{19}^z + 1728\hat{\sigma}_6^z\hat{\sigma}_{18}^z + 1872\hat{\sigma}_7^z\hat{\sigma}_{17}^z + 1728\hat{\sigma}_8^z\hat{\sigma}_{16}^z + 1008\hat{\sigma}_9^z\hat{\sigma}_{15}^z + 2636352\hat{\sigma}_{10}^z\hat{\sigma}_{14}^z + 2636352\hat{\sigma}_{11}^z\hat{\sigma}_{13}^z - \\
& 5272704\hat{\sigma}_2^z\hat{\sigma}_{24}^z - 5272704\hat{\sigma}_3^z\hat{\sigma}_{22}^z - 864\hat{\sigma}_4^z\hat{\sigma}_{21}^z - 288\hat{\sigma}_5^z\hat{\sigma}_{20}^z + 1728\hat{\sigma}_6^z\hat{\sigma}_{19}^z + 1728\hat{\sigma}_7^z\hat{\sigma}_{18}^z + 1728\hat{\sigma}_8^z\hat{\sigma}_{17}^z + \\
& 1728\hat{\sigma}_9^z\hat{\sigma}_{16}^z + 576\hat{\sigma}_{10}^z\hat{\sigma}_{15}^z + 2636352\hat{\sigma}_{11}^z\hat{\sigma}_{14}^z + 2636352\hat{\sigma}_{12}^z\hat{\sigma}_{13}^z - 5272704\hat{\sigma}_1^z\hat{\sigma}_{25}^z - 5272704\hat{\sigma}_2^z\hat{\sigma}_{24}^z - 1728\hat{\sigma}_4^z\hat{\sigma}_{22}^z - \\
& 288\hat{\sigma}_5^z\hat{\sigma}_{21}^z - 576\hat{\sigma}_6^z\hat{\sigma}_{20}^z + 1728\hat{\sigma}_7^z\hat{\sigma}_{19}^z + 1872\hat{\sigma}_8^z\hat{\sigma}_{18}^z + 1728\hat{\sigma}_9^z\hat{\sigma}_{17}^z + 1008\hat{\sigma}_{10}^z\hat{\sigma}_{16}^z + 1008\hat{\sigma}_{11}^z\hat{\sigma}_{15}^z + 2636352\hat{\sigma}_{12}^z\hat{\sigma}_{14}^z - \\
& 5272704\hat{\sigma}_1^z\hat{\sigma}_{26}^z - 1728\hat{\sigma}_3^z\hat{\sigma}_{24}^z - 5272704\hat{\sigma}_4^z\hat{\sigma}_{23}^z - 288\hat{\sigma}_5^z\hat{\sigma}_{22}^z - 288\hat{\sigma}_6^z\hat{\sigma}_{21}^z - 576\hat{\sigma}_7^z\hat{\sigma}_{20}^z + 1728\hat{\sigma}_8^z\hat{\sigma}_{19}^z + 1728\hat{\sigma}_9^z\hat{\sigma}_{18}^z + \\
& 1008\hat{\sigma}_{10}^z\hat{\sigma}_{17}^z + 1872\hat{\sigma}_{11}^z\hat{\sigma}_{16}^z + 1008\hat{\sigma}_{12}^z\hat{\sigma}_{15}^z + 2636352\hat{\sigma}_{13}^z\hat{\sigma}_{14}^z - 5272704\hat{\sigma}_3^z\hat{\sigma}_{25}^z - 864\hat{\sigma}_4^z\hat{\sigma}_{24}^z - 288\hat{\sigma}_5^z\hat{\sigma}_{23}^z - \\
& 576\hat{\sigma}_6^z\hat{\sigma}_{22}^z - 576\hat{\sigma}_7^z\hat{\sigma}_{21}^z - 576\hat{\sigma}_8^z\hat{\sigma}_{20}^z + 1872\hat{\sigma}_9^z\hat{\sigma}_{19}^z + 1008\hat{\sigma}_{10}^z\hat{\sigma}_{18}^z + 1728\hat{\sigma}_{11}^z\hat{\sigma}_{17}^z + 1728\hat{\sigma}_{12}^z\hat{\sigma}_{16}^z + 1008\hat{\sigma}_{13}^z\hat{\sigma}_{15}^z - \\
& 5272704\hat{\sigma}_2^z\hat{\sigma}_{27}^z - 1728\hat{\sigma}_4^z\hat{\sigma}_{25}^z - 576\hat{\sigma}_5^z\hat{\sigma}_{24}^z - 576\hat{\sigma}_6^z\hat{\sigma}_{23}^z - 576\hat{\sigma}_7^z\hat{\sigma}_{22}^z - 576\hat{\sigma}_8^z\hat{\sigma}_{21}^z - 288\hat{\sigma}_9^z\hat{\sigma}_{20}^z + 1008\hat{\sigma}_{10}^z\hat{\sigma}_{19}^z + \\
& 1728\hat{\sigma}_{11}^z\hat{\sigma}_{18}^z + 1872\hat{\sigma}_{12}^z\hat{\sigma}_{17}^z + 1728\hat{\sigma}_{13}^z\hat{\sigma}_{16}^z + 1008\hat{\sigma}_{14}^z\hat{\sigma}_{15}^z - 288\hat{\sigma}_0^z\hat{\sigma}_{30}^z - 5272704\hat{\sigma}_2^z\hat{\sigma}_{28}^z - 5272704\hat{\sigma}_3^z\hat{\sigma}_{27}^z - \\
& 5272704\hat{\sigma}_4^z\hat{\sigma}_{26}^z - 576\hat{\sigma}_5^z\hat{\sigma}_{25}^z - 1152\hat{\sigma}_6^z\hat{\sigma}_{24}^z - 288\hat{\sigma}_7^z\hat{\sigma}_{23}^z - 288\hat{\sigma}_8^z\hat{\sigma}_{22}^z - 576\hat{\sigma}_9^z\hat{\sigma}_{21}^z - 288\hat{\sigma}_{10}^z\hat{\sigma}_{20}^z + 1728\hat{\sigma}_{11}^z\hat{\sigma}_{19}^z + \\
& 1728\hat{\sigma}_{12}^z\hat{\sigma}_{18}^z + 1728\hat{\sigma}_{13}^z\hat{\sigma}_{17}^z + 1728\hat{\sigma}_{14}^z\hat{\sigma}_{16}^z - 288\hat{\sigma}_0^z\hat{\sigma}_{31}^z - 576\hat{\sigma}_1^z\hat{\sigma}_{30}^z - 1728\hat{\sigma}_4^z\hat{\sigma}_{27}^z - 576\hat{\sigma}_5^z\hat{\sigma}_{26}^z - 864\hat{\sigma}_6^z\hat{\sigma}_{25}^z - \\
& 1152\hat{\sigma}_7^z\hat{\sigma}_{24}^z - 576\hat{\sigma}_8^z\hat{\sigma}_{23}^z - 576\hat{\sigma}_9^z\hat{\sigma}_{22}^z - 288\hat{\sigma}_{10}^z\hat{\sigma}_{21}^z - 576\hat{\sigma}_{11}^z\hat{\sigma}_{20}^z + 1728\hat{\sigma}_{12}^z\hat{\sigma}_{19}^z + 1872\hat{\sigma}_{13}^z\hat{\sigma}_{18}^z + 1728\hat{\sigma}_{14}^z\hat{\sigma}_{17}^z + \\
& 2636352\hat{\sigma}_{15}^z\hat{\sigma}_{16}^z - 288\hat{\sigma}_0^z\hat{\sigma}_{32}^z - 288\hat{\sigma}_1^z\hat{\sigma}_{31}^z - 576\hat{\sigma}_2^z\hat{\sigma}_{30}^z - 5272704\hat{\sigma}_3^z\hat{\sigma}_{29}^z - 5272704\hat{\sigma}_4^z\hat{\sigma}_{28}^z - 576\hat{\sigma}_5^z\hat{\sigma}_{27}^z -
\end{aligned}$$

[illegible]

5272704 $\hat{\sigma}_{12}^{41}$ - 864 $\hat{\sigma}_{49}^{44}$ - 576 $\hat{\sigma}_{48}^{52}$ - 1152 $\hat{\sigma}_{47}^{60}$ - 864 $\hat{\sigma}_{46}^{67}$ - 1152 $\hat{\sigma}_{45}^{68}$ - 864 $\hat{\sigma}_{44}^{69}$ - 5272704 $\hat{\sigma}_{43}^{70}$ + 5272704 $\hat{\sigma}_{42}^{71}$ - 1728 $\hat{\sigma}_{41}^{72}$ - 864 $\hat{\sigma}_{40}^{73}$ - 576 $\hat{\sigma}_{39}^{74}$ - 1152 $\hat{\sigma}_{38}^{75}$ - 864 $\hat{\sigma}_{37}^{76}$ - 1152 $\hat{\sigma}_{36}^{77}$ - 864 $\hat{\sigma}_{35}^{78}$ - 864 $\hat{\sigma}_{34}^{79}$ + 1728 $\hat{\sigma}_{33}^{80}$ - 576 $\hat{\sigma}_{32}^{81}$ - 576 $\hat{\sigma}_{31}^{82}$ - 288 $\hat{\sigma}_{30}^{83}$ - 576 $\hat{\sigma}_{29}^{84}$ - 864 $\hat{\sigma}_{28}^{85}$ - 864 $\hat{\sigma}_{27}^{86}$ - 864 $\hat{\sigma}_{26}^{87}$ - 1152 $\hat{\sigma}_{25}^{88}$ - 1728 $\hat{\sigma}_{24}^{89}$ - 864 $\hat{\sigma}_{23}^{90}$ - 576 $\hat{\sigma}_{22}^{91}$ - 576 $\hat{\sigma}_{21}^{92}$ - 576 $\hat{\sigma}_{20}^{93}$ - 1152 $\hat{\sigma}_{19}^{94}$ - 288 $\hat{\sigma}_{18}^{95}$ - 288 $\hat{\sigma}_{17}^{96}$ - 288 $\hat{\sigma}_{16}^{97}$ - 288 $\hat{\sigma}_{15}^{98}$ - 288 $\hat{\sigma}_{14}^{99}$ - 288 $\hat{\sigma}_{13}^{100}$ - 288 $\hat{\sigma}_{12}^{101}$ - 288 $\hat{\sigma}_{11}^{102}$ - 288 $\hat{\sigma}_{10}^{103}$ - 288 $\hat{\sigma}_{9}^{104}$ - 288 $\hat{\sigma}_{8}^{105}$ - 288 $\hat{\sigma}_{7}^{106}$ - 288 $\hat{\sigma}_{6}^{107}$ - 288 $\hat{\sigma}_{5}^{108}$ - 288 $\hat{\sigma}_{4}^{109}$ - 288 $\hat{\sigma}_{3}^{110}$ - 288 $\hat{\sigma}_{2}^{111}$ - 288 $\hat{\sigma}_{1}^{112}$ - 288 $\hat{\sigma}_{0}^{113}$ - 288 $\hat{\sigma}_{-1}^{114}$ - 288 $\hat{\sigma}_{-2}^{115}$ - 288 $\hat{\sigma}_{-3}^{116}$ - 288 $\hat{\sigma}_{-4}^{117}$ - 288 $\hat{\sigma}_{-5}^{118}$ - 288 $\hat{\sigma}_{-6}^{119}$ - 288 $\hat{\sigma}_{-7}^{120}$ - 288 $\hat{\sigma}_{-8}^{121}$ - 288 $\hat{\sigma}_{-9}^{122}$ - 288 $\hat{\sigma}_{-10}^{123}$ - 288 $\hat{\sigma}_{-11}^{124}$ - 288 $\hat{\sigma}_{-12}^{125}$ - 288 $\hat{\sigma}_{-13}^{126}$ - 288 $\hat{\sigma}_{-14}^{127}$ - 288 $\hat{\sigma}_{-15}^{128}$ - 288 $\hat{\sigma}_{-16}^{129}$ - 288 $\hat{\sigma}_{-17}^{130}$ - 288 $\hat{\sigma}_{-18}^{131}$ - 288 $\hat{\sigma}_{-19}^{132}$ - 288 $\hat{\sigma}_{-20}^{133}$ - 288 $\hat{\sigma}_{-21}^{134}$ - 288 $\hat{\sigma}_{-22}^{135}$ - 288 $\hat{\sigma}_{-23}^{136}$ - 288 $\hat{\sigma}_{-24}^{137}$ - 288 $\hat{\sigma}_{-25}^{138}$ - 288 $\hat{\sigma}_{-26}^{139}$ - 288 $\hat{\sigma}_{-27}^{140}$ - 288 $\hat{\sigma}_{-28}^{141}$ - 288 $\hat{\sigma}_{-29}^{142}$ - 288 $\hat{\sigma}_{-30}^{143}$ - 288 $\hat{\sigma}_{-31}^{144}$ - 288 $\hat{\sigma}_{-32}^{145}$ - 288 $\hat{\sigma}_{-33}^{146}$ - 288 $\hat{\sigma}_{-34}^{147}$ - 288 $\hat{\sigma}_{-35}^{148}$ - 288 $\hat{\sigma}_{-36}^{149}$ - 288 $\hat{\sigma}_{-37}^{150}$ - 288 $\hat{\sigma}_{-38}^{151}$ - 288 $\hat{\sigma}_{-39}^{152}$ - 288 $\hat{\sigma}_{-40}^{153}$ - 288 $\hat{\sigma}_{-41}^{154}$ - 288 $\hat{\sigma}_{-42}^{155}$ - 288 $\hat{\sigma}_{-43}^{156}$ - 288 $\hat{\sigma}_{-44}^{157}$ - 288 $\hat{\sigma}_{-45}^{158}$ - 288 $\hat{\sigma}_{-46}^{159}$ - 288 $\hat{\sigma}_{-47}^{160}$ - 288 $\hat{\sigma}_{-48}^{161}$ - 288 $\hat{\sigma}_{-49}^{162}$ - 288 $\hat{\sigma}_{-50}^{163}$ - 288 $\hat{\sigma}_{-51}^{164}$ - 288 $\hat{\sigma}_{-52}^{165}$ - 288 $\hat{\sigma}_{-53}^{166}$ - 288 $\hat{\sigma}_{-54}^{167}$ - 288 $\hat{\sigma}_{-55}^{168}$ - 288 $\hat{\sigma}_{-56}^{169}$ - 288 $\hat{\sigma}_{-57}^{170}$ - 288 $\hat{\sigma}_{-58}^{171}$ - 288 $\hat{\sigma}_{-59}^{172}$ - 288 $\hat{\sigma}_{-60}^{173}$ - 288 $\hat{\sigma}_{-61}^{174}$ - 288 $\hat{\sigma}_{-62}^{175}$ - 288 $\hat{\sigma}_{-63}^{176}$ - 288 $\hat{\sigma}_{-64}^{177}$ - 288 $\hat{\sigma}_{-65}^{178}$ - 288 $\hat{\sigma}_{-66}^{179}$ - 288 $\hat{\sigma}_{-67}^{180}$ - 288 $\hat{\sigma}_{-68}^{181}$ - 288 $\hat{\sigma}_{-69}^{182}$ - 288 $\hat{\sigma}_{-70}^{183}$ - 288 $\hat{\sigma}_{-71}^{184}$ - 288 $\hat{\sigma}_{-72}^{185}$ - 288 $\hat{\sigma}_{-73}^{186}$ - 288 $\hat{\sigma}_{-74}^{187}$ - 288 $\hat{\sigma}_{-75}^{188}$ - 288 $\hat{\sigma}_{-76}^{189}$ - 288 $\hat{\sigma}_{-77}^{190}$ - 288 $\hat{\sigma}_{-78}^{191}$ - 288 $\hat{\sigma}_{-79}^{192}$ - 288 $\hat{\sigma}_{-80}^{193}$ - 288 $\hat{\sigma}_{-81}^{194}$ - 288 $\hat{\sigma}_{-82}^{195}$ - 288 $\hat{\sigma}_{-83}^{196}$ - 288 $\hat{\sigma}_{-84}^{197}$ - 288 $\hat{\sigma}_{-85}^{198}$ - 288 $\hat{\sigma}_{-86}^{199}$ - 288 $\hat{\sigma}_{-87}^{200}$ - 288 $\hat{\sigma}_{-88}^{201}$ - 288 $\hat{\sigma}_{-89}^{202}$ - 288 $\hat{\sigma}_{-90}^{203}$ - 288 $\hat{\sigma}_{-91}^{204}$ - 288 $\hat{\sigma}_{-92}^{205}$ - 288 $\hat{\sigma}_{-93}^{206}$ - 288 $\hat{\sigma}_{-94}^{207}$ - 288 $\hat{\sigma}_{-95}^{208}$ - 288 $\hat{\sigma}_{-96}^{209}$ - 288 $\hat{\sigma}_{-97}^{210}$ - 288 $\hat{\sigma}_{-98}^{211}$ - 288 $\hat{\sigma}_{-99}^{212}$ - 288 $\hat{\sigma}_{-100}^{213}$ - 288 $\hat{\sigma}_{-101}^{214}$ - 288 $\hat{\sigma}_{-102}^{215}$ - 288 $\hat{\sigma}_{-103}^{216}$ - 288 $\hat{\sigma}_{-104}^{217}$ - 288 $\hat{\sigma}_{-105}^{218}$ - 288 $\hat{\sigma}_{-106}^{219}$ - 288 $\hat{\sigma}_{-107}^{220}$ - 288 $\hat{\sigma}_{-108}^{221}$ - 288 $\hat{\sigma}_{-109}^{222}$ - 288 $\hat{\sigma}_{-110}^{223}$ - 288 $\hat{\sigma}_{-111}^{224}$ - 288 $\hat{\sigma}_{-112}^{225}$ - 288 $\hat{\sigma}_{-113}^{226}$ - 288 $\hat{\sigma}_{-114}^{227}$ - 288 $\hat{\sigma}_{-115}^{228}$ - 288 $\hat{\sigma}_{-116}^{229}$ - 288 $\hat{\sigma}_{-117}^{230}$ - 288 $\hat{\sigma}_{-118}^{231}$ - 288 $\hat{\sigma}_{-119}^{232}$ - 288 $\hat{\sigma}_{-120}^{233}$ - 288 $\hat{\sigma}_{-121}^{234}$ - 288 $\hat{\sigma}_{-122}^{235}$ - 288 $\hat{\sigma}_{-123}^{236}$ - 288 $\hat{\sigma}_{-124}^{237}$ - 288 $\hat{\sigma}_{-125}^{238}$ - 288 $\hat{\sigma}_{-126}^{239}$ - 288 $\hat{\sigma}_{-127}^{240}$ - 288 $\hat{\sigma}_{-128}^{241}$ - 288 $\hat{\sigma}_{-129}^{242}$ - 288 $\hat{\sigma}_{$

576 $\hat{\sigma}_{31}^{41}$ - 864 $\hat{\sigma}_{14}^{59}$ - 5272704 $\hat{\sigma}_{18}^{55}$ - 864 $\hat{\sigma}_{19}^{54}$ + 576 $\hat{\sigma}_{24}^{49}$ + 576 $\hat{\sigma}_{25}^{48}$ + 576 $\hat{\sigma}_{26}^{47}$ + 576 $\hat{\sigma}_{27}^{46}$ + 576 $\hat{\sigma}_{28}^{45}$ + 576 $\hat{\sigma}_{29}^{44}$ + 1728 $\hat{\sigma}_{34}^{39}$ - 5272704 $\hat{\sigma}_{17}^{57}$ - 1728 $\hat{\sigma}_{19}^{55}$ + 576 $\hat{\sigma}_{20}^{54}$ + 576 $\hat{\sigma}_{22}^{52}$ + 576 $\hat{\sigma}_{24}^{50}$ + 576 $\hat{\sigma}_{25}^{49}$ + 576 $\hat{\sigma}_{26}^{48}$ + 1152 $\hat{\sigma}_{27}^{47}$ + 576 $\hat{\sigma}_{28}^{46}$ + 576 $\hat{\sigma}_{29}^{45}$ + 576 $\hat{\sigma}_{30}^{44}$ + 576 $\hat{\sigma}_{32}^{42}$ + 576 $\hat{\sigma}_{34}^{40}$ - 5272704 $\hat{\sigma}_{17}^{58}$ - 5272704 $\hat{\sigma}_{18}^{57}$ - 5272704 $\hat{\sigma}_{19}^{56}$ - 1728 $\hat{\sigma}_{19}^{57}$ + 576 $\hat{\sigma}_{21}^{55}$ + 576 $\hat{\sigma}_{22}^{54}$ + 576 $\hat{\sigma}_{23}^{53}$ + 576 $\hat{\sigma}_{24}^{52}$ + 576 $\hat{\sigma}_{25}^{51}$ + 576 $\hat{\sigma}_{27}^{49}$ + 1152 $\hat{\sigma}_{28}^{48}$ + 576 $\hat{\sigma}_{29}^{47}$ + 576 $\hat{\sigma}_{31}^{45}$ + 576 $\hat{\sigma}_{32}^{44}$ + 576 $\hat{\sigma}_{33}^{43}$ + 576 $\hat{\sigma}_{34}^{42}$ + 576 $\hat{\sigma}_{35}^{41}$ - 5272704 $\hat{\sigma}_{18}^{59}$ - 5272704 $\hat{\sigma}_{19}^{58}$ + 576 $\hat{\sigma}_{20}^{57}$ + 576 $\hat{\sigma}_{27}^{50}$ + 576 $\hat{\sigma}_{28}^{49}$ + 576 $\hat{\sigma}_{29}^{48}$ + 576 $\hat{\sigma}_{30}^{47}$ + 576 $\hat{\sigma}_{37}^{40}$ - 5272704 $\hat{\sigma}_{19}^{59}$ + 576 $\hat{\sigma}_{22}^{56}$ + 576 $\hat{\sigma}_{23}^{55}$ + 1152 $\hat{\sigma}_{24}^{54}$ + 576 $\hat{\sigma}_{25}^{53}$ + 576 $\hat{\sigma}_{26}^{52}$ + 1152 $\hat{\sigma}_{29}^{49}$ + 576 $\hat{\sigma}_{32}^{46}$ + 576 $\hat{\sigma}_{33}^{45}$ + 1152 $\hat{\sigma}_{34}^{44}$ + 576 $\hat{\sigma}_{35}^{43}$ + 576 $\hat{\sigma}_{36}^{42}$ + 576 $\hat{\sigma}_{20}^{59}$ + 576 $\hat{\sigma}_{21}^{58}$ + 576 $\hat{\sigma}_{23}^{56}$ + 576 $\hat{\sigma}_{26}^{53}$ + 576 $\hat{\sigma}_{28}^{51}$ + 576 $\hat{\sigma}_{29}^{50}$ + 576 $\hat{\sigma}_{30}^{49}$ + 576 $\hat{\sigma}_{31}^{48}$ + 576 $\hat{\sigma}_{33}^{46}$ + 576 $\hat{\sigma}_{36}^{43}$ + 576 $\hat{\sigma}_{38}^{41}$ + 576 $\hat{\sigma}_{39}^{40}$ + 576 $\hat{\sigma}_{21}^{59}$ + 576 $\hat{\sigma}_{22}^{58}$ + 576 $\hat{\sigma}_{23}^{57}$ + 576 $\hat{\sigma}_{24}^{56}$ + 1152 $\hat{\sigma}_{25}^{55}$ + 576 $\hat{\sigma}_{26}^{54}$ + 576 $\hat{\sigma}_{27}^{53}$ + 576 $\hat{\sigma}_{28}^{52}$ + 576 $\hat{\sigma}_{29}^{51}$ + 576 $\hat{\sigma}_{30}^{50}$ + 576 $\hat{\sigma}_{31}^{49}$ + 576 $\hat{\sigma}_{32}^{48}$ + 576 $\hat{\sigma}_{33}^{47}$ + 576 $\hat{\sigma}_{34}^{46}$ + 1152 $\hat{\sigma}_{35}^{45}$ + 576 $\hat{\sigma}_{36}^{44}$ + 576 $\hat{\sigma}_{37}^{43}$ + 576 $\hat{\sigma}_{38}^{42}$ + 576 $\hat{\sigma}_{39}^{41}$ + 576 $\hat{\sigma}_{24}^{57}$ + 576 $\hat{\sigma}_{25}^{56}$ + 576 $\hat{\sigma}_{26}^{55}$ + 576 $\hat{\sigma}_{27}^{54}$ + 576 $\hat{\sigma}_{34}^{47}$ + 576 $\hat{\sigma}_{35}^{46}$ + 576 $\hat{\sigma}_{36}^{45}$ + 576 $\hat{\sigma}_{37}^{44}$ + 576 $\hat{\sigma}_{24}^{58}$ + 576 $\hat{\sigma}_{25}^{57}$ + 1152 $\hat{\sigma}_{26}^{56}$ + 576 $\hat{\sigma}_{27}^{55}$ + 576 $\hat{\sigma}_{28}^{54}$ + 576 $\hat{\sigma}_{31}^{51}$ + 576 $\hat{\sigma}_{34}^{48}$ + 576 $\hat{\sigma}_{35}^{47}$ + 1152 $\hat{\sigma}_{36}^{46}$ + 576 $\hat{\sigma}_{37}^{45}$ + 576 $\hat{\sigma}_{38}^{44}$ + 576 $\hat{\sigma}_{24}^{59}$ + 576 $\hat{\sigma}_{25}^{58}$ + 576 $\hat{\sigma}_{26}^{57}$ + 576 $\hat{\sigma}_{27}^{56}$ + 576 $\hat{\sigma}_{28}^{55}$ + 576 $\hat{\sigma}_{29}^{54}$ + 576 $\hat{\sigma}_{34}^{49}$ + 576 $\hat{\sigma}_{35}^{48}$ + 576 $\hat{\sigma}_{36}^{47}$ + 576 $\hat{\sigma}_{37}^{46}$ + 576 $\hat{\sigma}_{38}^{45}$ + 576 $\hat{\sigma}_{39}^{44}$ + 576 $\hat{\sigma}_{25}^{59}$ + 576 $\hat{\sigma}_{26}^{58}$ + 1152 $\hat{\sigma}_{27}^{57}$ + 576 $\hat{\sigma}_{28}^{56}$ + 576 $\hat{\sigma}_{29}^{55}$ + 576 $\hat{\sigma}_{30}^{54}$ + 576 $\hat{\sigma}_{32}^{52}$ + 576 $\hat{\sigma}_{34}^{50}$ + 576 $\hat{\sigma}_{35}^{49}$ + 576 $\hat{\sigma}_{36}^{48}$ + 1152 $\hat{\sigma}_{37}^{47}$ + 576 $\hat{\sigma}_{38}^{46}$ + 576 $\hat{\sigma}_{39}^{45}$ + 576 $\hat{\sigma}_{27}^{59}$ + 1152 $\hat{\sigma}_{28}^{58}$ + 576 $\hat{\sigma}_{29}^{57}$ + 576 $\hat{\sigma}_{31}^{55}$ + 576 $\hat{\sigma}_{32}^{54}$ + 576 $\hat{\sigma}_{33}^{53}$ + 576 $\hat{\sigma}_{34}^{52}$ + 576 $\hat{\sigma}_{35}^{51}$ + 576 $\hat{\sigma}_{37}^{49}$ + 1152 $\hat{\sigma}_{38}^{48}$ + 576 $\hat{\sigma}_{39}^{47}$ + 576 $\hat{\sigma}_{28}^{59}$ + 576 $\hat{\sigma}_{29}^{58}$ + 576 $\hat{\sigma}_{30}^{57}$ + 576 $\hat{\sigma}_{37}^{50}$ + 576 $\hat{\sigma}_{38}^{49}$ + 576 $\hat{\sigma}_{39}^{48}$ + 1728 $\hat{\sigma}_{40}^{47}$ + 1152 $\hat{\sigma}_{29}^{59}$ + 576 $\hat{\sigma}_{32}^{56}$ + 576 $\hat{\sigma}_{33}^{55}$ + 1152 $\hat{\sigma}_{34}^{54}$ + 576 $\hat{\sigma}_{35}^{53}$ + 576 $\hat{\sigma}_{36}^{52}$ + 1152 $\hat{\sigma}_{39}^{49}$ + 576 $\hat{\sigma}_{30}^{59}$ + 576 $\hat{\sigma}_{31}^{58}$ + 576 $\hat{\sigma}_{33}^{56}$ + 576 $\hat{\sigma}_{36}^{53}$ + 576 $\hat{\sigma}_{38}^{51}$ + 576 $\hat{\sigma}_{39}^{50}$ + 1728 $\hat{\sigma}_{40}^{49}$ + 576 $\hat{\sigma}_{31}^{59}$ + 576 $\hat{\sigma}_{32}^{58}$ + 576 $\hat{\sigma}_{33}^{57}$ + 576 $\hat{\sigma}_{34}^{56}$ + 1152 $\hat{\sigma}_{35}^{55}$ + 576 $\hat{\sigma}_{36}^{54}$ + 576 $\hat{\sigma}_{37}^{53}$ + 576 $\hat{\sigma}_{38}^{52}$ + 576 $\hat{\sigma}_{39}^{51}$ + 576 $\hat{\sigma}_{40}^{50}$ + 1728 $\hat{\sigma}_{41}^{49}$ + 576 $\hat{\sigma}_{34}^{57}$ + 576 $\hat{\sigma}_{35}^{56}$ + 576 $\hat{\sigma}_{36}^{55}$ + 576 $\hat{\sigma}_{37}^{54}$ + 576 $\hat{\sigma}_{34}^{58}$ + 576 $\hat{\sigma}_{35}^{57}$ + 1152 $\hat{\sigma}_{36}^{56}$ + 576 $\hat{\sigma}_{37}^{55}$ + 576 $\hat{\sigma}_{38}^{54}$ + 576 $\hat{\sigma}_{41}^{51}$ + 576 $\hat{\sigma}_{34}^{59}$ + 576 $\hat{\sigma}_{35}^{58}$ + 576 $\hat{\sigma}_{36}^{57}$ + 576 $\$

Complete Expression in the Turyn Based Method

A complete expression of $E_k(s)$ in 68-order H matrix using Turyn based method.

$$\begin{aligned}
 E_k(s) = & 2s_0 + 2s_1 - 4s_2 + 4s_3 - 4s_4 + 8s_5 + 8s_6 + 8s_7 + 8s_8 + 8s_{10} + 8s_{12} + 4s_{10}s_2 + 6s_{10}s_3 + 4s_1s_2 - 6s_{10}s_4 - 2s_1s_3 + \\
 & 4s_0s_5 + 2s_1s_4 - 2s_2s_3 + 4s_0s_6 + 4s_1s_5 + 2s_2s_4 + 4s_0s_7 + 4s_1s_6 - 8s_3s_4 + 4s_0s_8 + 4s_1s_7 + 4s_0s_9 + 4s_1s_8 + 8s_0s_{10} + 4s_1s_9 - \\
 & 4s_0s_{11} + 8s_2s_9 + 4s_1s_{11} + 8s_5s_7 + 4s_3s_{10} + 16s_5s_8 + 16s_6s_7 - 8s_2s_{12} - 4s_3s_{11} - 4s_4s_{10} + 8s_5s_9 + 8s_6s_8 + 4s_4s_{11} + \\
 & 8s_6s_{10} + 8s_5s_{12} + 8s_6s_{11} + 8s_7s_{10} + 8s_8s_9 + 8s_7s_{11} + 8s_8s_{12} + 8s_9s_{11} + 8s_{10}s_{12} + 4s_0s_1s_2 - 2s_0s_2s_3 + 4s_0s_1s_5 + 2s_0s_2s_4 + \\
 & 2s_1s_2s_3 + 2s_0s_3s_4 - 2s_1s_2s_4 + 2s_1s_3s_4 + 4s_0s_1s_8 + 8s_2s_3s_4 + 4s_0s_1s_9 + 4s_2s_3s_5 + 4s_0s_5s_6 - 4s_2s_3s_6 - 4s_2s_4s_5 + 8s_0s_5s_7 + \\
 & 4s_1s_5s_6 - 4s_2s_3s_7 + 4s_2s_4s_6 + 4s_3s_4s_5 - 4s_0s_5s_8 + 4s_0s_6s_7 + 4s_2s_3s_8 + 4s_2s_4s_7 + 8s_2s_5s_6 + 8s_0s_6s_8 + 4s_1s_5s_8 + 4s_1s_6s_7 + \\
 & 4s_2s_3s_9 - 4s_2s_4s_8 + 4s_0s_7s_8 - 4s_2s_3s_{10} - 4s_2s_4s_9 + 8s_2s_6s_7 + 4s_3s_4s_8 + 4s_3s_5s_7 + 4s_1s_7s_8 + 4s_2s_4s_{10} + 4s_3s_4s_9 - \\
 & 4s_3s_5s_8 - 4s_4s_5s_7 + 8s_2s_7s_8 + 4s_3s_6s_8 + 4s_4s_5s_8 - 4s_4s_6s_8 + 16s_5s_6s_7 + 4s_0s_9s_{10} + 16s_5s_6s_8 + 8s_0s_9s_{11} + 4s_1s_9s_{10} + \\
 & 8s_5s_6s_9 + 16s_5s_7s_8 - 4s_0s_9s_{12} + 4s_0s_{10}s_{11} + 8s_2s_9s_{10} + 16s_6s_7s_8 + 8s_0s_{10}s_{12} + 4s_1s_9s_{12} + 4s_1s_{10}s_{11} + 8s_5s_7s_{10} + \\
 & 8s_6s_7s_9 + 4s_0s_{11}s_{12} + 8s_2s_{10}s_{11} + 4s_3s_9s_{11} + 4s_1s_{11}s_{12} - 4s_3s_9s_{12} - 4s_4s_9s_{11} + 8s_5s_8s_{11} + 8s_5s_9s_{10} + 8s_6s_8s_{10} + \\
 & 8s_7s_8s_9 + 8s_2s_{11}s_{12} + 4s_3s_{10}s_{12} + 4s_4s_9s_{12} - 4s_4s_{10}s_{12} + 8s_5s_{10}s_{11} + 8s_6s_9s_{11} + 8s_6s_9s_{12} + 8s_7s_9s_{11} + 8s_8s_9s_{10} + \\
 & 8s_5s_{11}s_{12} + 8s_6s_{10}s_{12} + 8s_7s_9s_{12} + 8s_7s_{10}s_{12} + 8s_8s_{10}s_{11} + 16s_9s_{10}s_{11} + 8s_8s_{11}s_{12} + 16s_9s_{11}s_{12} + 2s_0s_1s_2s_3 - \\
 & 2s_0s_1s_2s_4 + 2s_0s_1s_3s_4 + 4s_0s_1s_5s_6 + 4s_0s_1s_6s_7 + 4s_0s_1s_7s_8 + 4s_2s_3s_5s_6 - 4s_2s_3s_5s_7 - 4s_2s_4s_5s_6 + 4s_2s_3s_6s_7 + \\
 & 4s_2s_4s_5s_7 + 4s_3s_4s_5s_6 - 4s_2s_3s_6s_8 - 4s_2s_4s_6s_7 + 4s_0s_1s_9s_{10} + 4s_2s_3s_7s_8 + 4s_2s_4s_6s_8 + 4s_3s_4s_6s_7 - 4s_2s_4s_7s_8 + \\
 & 4s_0s_1s_{10}s_{11} + 4s_3s_4s_7s_8 + 4s_0s_1s_{11}s_{12} + 4s_2s_3s_9s_{10} - 4s_2s_3s_9s_{11} - 4s_2s_4s_9s_{10} + 4s_2s_3s_{10}s_{11} + 4s_2s_4s_9s_{11} + \\
 & 4s_3s_4s_9s_{10} + 16s_5s_6s_7s_8 - 4s_2s_3s_{10}s_{12} - 4s_2s_4s_{10}s_{11} + 4s_2s_3s_{11}s_{12} + 4s_2s_4s_{10}s_{12} + 4s_3s_4s_{10}s_{11} - 4s_2s_4s_{11}s_{12} + \\
 & 4s_3s_4s_{11}s_{12} + 8s_5s_6s_9s_{10} + 8s_5s_6s_{10}s_{11} + 8s_5s_7s_9s_{11} + 8s_6s_7s_9s_{10} + 8s_5s_6s_{11}s_{12} + 8s_5s_7s_{10}s_{12} + 8s_5s_8s_9s_{12} + \\
 & 8s_6s_7s_{10}s_{11} + 8s_6s_8s_9s_{11} + 8s_7s_8s_9s_{10} + 8s_6s_7s_{11}s_{12} + 8s_6s_8s_{10}s_{12} + 8s_7s_8s_{10}s_{11} + 8s_7s_8s_{11}s_{12} + 16s_9s_{10}s_{11}s_{12} + 122
 \end{aligned}$$

A complete expression of $E_k(q)$ in 68-order H matrix using Turyn based method.

$$\begin{aligned}
 E_k(q) = & 168q_0q_1 - 212q_1 - 128q_2 - 132q_3 - 36q_4 - 512q_5 - 576q_6 - 576q_7 - 512q_8 - 496q_9 - \\
 & 512q_{10} - 496q_{11} - 368q_{12} - 244q_0 + 32q_0q_2 + 40q_0q_3 + 32q_1q_2 - 8q_0q_4 + 24q_1q_3 + 80q_0q_5 + 8q_1q_4 + \\
 & 64q_2q_3 + 112q_0q_6 + 80q_1q_5 + 112q_0q_7 + 80q_1q_6 + 32q_2q_5 + 168q_3q_4 + 80q_0q_8 + 80q_1q_7 + 64q_2q_6 + \\
 & 48q_3q_5 + 80q_0q_9 + 80q_1q_8 + 64q_2q_7 + 48q_3q_6 + 16q_4q_5 + 128q_0q_{10} + 80q_1q_9 + 32q_2q_8 + 48q_3q_7 + 16q_4q_6 + \\
 & 80q_0q_{11} + 64q_1q_{10} + 64q_2q_9 + 48q_3q_8 + 16q_4q_7 + 416q_5q_6 + 48q_0q_{12} + 80q_1q_{11} + 64q_2q_{10} + 48q_3q_9 + \\
 & 16q_4q_8 + 352q_5q_7 + 48q_1q_{12} + 64q_2q_{11} + 64q_3q_{10} + 16q_4q_9 + 320q_5q_8 + 480q_6q_7 + 48q_3q_{11} + 192q_5q_9 + \\
 & 352q_6q_8 + 16q_3q_{12} + 16q_4q_{11} + 192q_5q_{10} + 224q_6q_9 + 416q_7q_8 + 16q_4q_{12} + 192q_5q_{11} + 256q_6q_{10} + \\
 & 224q_7q_9 + 160q_5q_{12} + 224q_6q_{11} + 256q_7q_{10} + 192q_8q_9 + 160q_6q_{12} + 224q_7q_{11} + 192q_8q_{10} + 160q_7q_{12} + \\
 & 192q_8q_{11} + 384q_9q_{10} + 160q_8q_{12} + 384q_9q_{11} + 224q_9q_{12} + 384q_{10}q_{11} + 256q_{10}q_{12} + 384q_{11}q_{12} - 32q_0q_1q_2 - \\
 & 32q_0q_1q_3 - 64q_0q_1q_5 - 32q_1q_2q_3 - 64q_0q_1q_6 - 32q_0q_3q_4 + 32q_1q_2q_4 - 64q_0q_1q_7 - 32q_1q_3q_4 - 64q_0q_1q_8 - \\
 & 64q_2q_3q_4 - 64q_0q_1q_9 - 32q_2q_3q_5 - 64q_0q_1q_{10} - 64q_0q_5q_6 + 32q_2q_4q_5 - 64q_0q_1q_{11} - 64q_0q_5q_7 - 64q_1q_5q_6 - \\
 & 64q_3q_4q_5 - 32q_0q_1q_{12} + 32q_0q_5q_8 - 64q_0q_6q_7 - 32q_2q_3q_8 - 64q_2q_5q_6 - 64q_3q_4q_6 - 64q_0q_6q_8 - 32q_1q_5q_8 - \\
 & 64q_1q_6q_7 - 32q_2q_3q_9 + 32q_2q_4q_8 - 64q_3q_4q_7 - 64q_3q_5q_6 - 64q_0q_7q_8 + 32q_2q_4q_9 - 64q_2q_6q_7 - 64q_3q_4q_8 - \\
 & 64q_1q_7q_8 - 32q_2q_3q_{11} - 64q_3q_4q_9 + 32q_3q_5q_8 - 64q_3q_6q_7 + 32q_2q_4q_{11} - 64q_2q_7q_8 - 64q_3q_4q_{10} - \\
 & 32q_4q_5q_8 - 64q_3q_4q_{11} - 64q_3q_7q_8 - 256q_5q_6q_7 - 64q_0q_9q_{10} - 32q_3q_4q_{12} - 256q_5q_6q_8 - 64q_0q_9q_{11} - \\
 & 64q_1q_9q_{10} - 128q_5q_6q_9 - 256q_5q_7q_8 + 32q_0q_9q_{12} - 64q_0q_{10}q_{11} - 64q_2q_9q_{10} - 128q_5q_6q_{10} - 64q_5q_7q_9 - \\
 & 256q_6q_7q_8 - 64q_0q_{10}q_{12} - 32q_1q_9q_{12} - 64q_1q_{10}q_{11} - 64q_3q_9q_{10} - 128q_5q_6q_{11} - 128q_5q_7q_{10} - 64q_5q_8q_9 - \\
 & 128q_6q_7q_9 - 64q_0q_{11}q_{12} - 64q_2q_{10}q_{11} - 64q_5q_6q_{12} - 64q_5q_7q_{11} - 128q_6q_7q_{10} - 64q_6q_8q_9 - 64q_1q_{11}q_{12} + \\
 & 32q_3q_9q_{12} - 64q_3q_{10}q_{11} - 64q_5q_7q_{12} - 64q_5q_8q_{11} - 128q_5q_9q_{10} - 128q_6q_7q_{11} - 128q_6q_8q_{10} - 128q_7q_8q_9 - \\
 & 64q_2q_{11}q_{12} - 32q_4q_9q_{12} - 64q_5q_8q_{12} - 64q_5q_9q_{11} - 64q_6q_7q_{12} - 64q_6q_8q_{11} - 128q_6q_9q_{10} - 128q_7q_8q_{10} - \\
 & 64q_3q_{11}q_{12} - 64q_5q_9q_{12} - 128q_5q_{10}q_{11} - 64q_6q_8q_{12} - 128q_6q_9q_{11} - 128q_7q_8q_{11} - 128q_7q_9q_{10} - 64q_5q_{10}q_{12} - \\
 & 64q_6q_9q_{12} - 128q_6q_{10}q_{11} - 64q_7q_8q_{12} - 128q_7q_9q_{11} - 128q_8q_9q_{10} - 128q_5q_{11}q_{12} - 128q_6q_{10}q_{12} - \\
 & 64q_7q_9q_{12} - 128q_7q_{10}q_{11} - 64q_8q_9q_{11} - 128q_6q_{11}q_{12} - 128q_7q_{10}q_{12} - 64q_8q_9q_{12} - 128q_8q_{10}q_{11} - \\
 & 128q_7q_{11}q_{12} - 64q_8q_{10}q_{12} - 256q_9q_{10}q_{11} - 128q_8q_{11}q_{12} - 128q_9q_{10}q_{12} - 256q_9q_{11}q_{12} - 128q_{10}q_{11}q_{12} +
 \end{aligned}$$

$$\begin{aligned}
& 32q_0q_1q_2q_3 - 32q_0q_1q_2q_4 + 32q_0q_1q_3q_4 + 64q_0q_1q_5q_6 + 64q_0q_1q_6q_7 + 64q_0q_1q_7q_8 + 64q_2q_3q_5q_6 - \\
& 64q_2q_3q_5q_7 - 64q_2q_4q_5q_6 + 64q_2q_3q_6q_7 + 64q_2q_4q_5q_7 + 64q_3q_4q_5q_6 - 64q_2q_3q_6q_8 - 64q_2q_4q_6q_7 + \\
& 64q_0q_1q_9q_{10} + 64q_2q_3q_7q_8 + 64q_2q_4q_6q_8 + 64q_3q_4q_6q_7 - 64q_2q_4q_7q_8 + 64q_0q_1q_{10}q_{11} + 64q_3q_4q_7q_8 + \\
& 64q_0q_1q_{11}q_{12} + 64q_2q_3q_9q_{10} - 64q_2q_3q_9q_{11} - 64q_2q_4q_9q_{10} + 64q_2q_3q_{10}q_{11} + 64q_2q_4q_9q_{11} + 64q_3q_4q_9q_{10} + \\
& 256q_5q_6q_7q_8 - 64q_2q_3q_{10}q_{12} - 64q_2q_4q_{10}q_{11} + 64q_2q_3q_{11}q_{12} + 64q_2q_4q_{10}q_{12} + 64q_3q_4q_{10}q_{11} - 64q_2q_4q_{11}q_{12} + \\
& 64q_3q_4q_{11}q_{12} + 128q_5q_6q_9q_{10} + 128q_5q_6q_{10}q_{11} + 128q_5q_7q_9q_{11} + 128q_6q_7q_9q_{10} + 128q_5q_6q_{11}q_{12} + 128q_5q_7q_{10}q_{12} + \\
& 128q_5q_8q_9q_{12} + 128q_6q_7q_{10}q_{11} + 128q_6q_8q_9q_{11} + 128q_7q_8q_9q_{10} + 128q_6q_7q_{11}q_{12} + 128q_6q_8q_{10}q_{12} + \\
& 128q_7q_8q_{10}q_{11} + 128q_7q_8q_{11}q_{12} + 256q_9q_{10}q_{11}q_{12} + 948
\end{aligned}$$

A complete expression of $E_2(q)$ in 68-order H matrix using Turyn based method, using $\delta = 61, 032$.

$$\begin{aligned}
E_2(q) = & 183264q_{13} - 212q_1 - 128q_2 - 132q_3 - 36q_4 - 512q_5 - 576q_6 - 576q_7 - 512q_8 - 496q_9 - 512q_{10} - \\
& 496q_{11} - 368q_{12} - 244q_0 + 183136q_{14} + 183176q_{15} + 183208q_{16} + 183208q_{17} + 183176q_{18} + 183224q_{19} + \\
& 183176q_{20} + 183128q_{21} + 183120q_{22} + 183176q_{23} + 183176q_{24} + 183176q_{25} + 183176q_{26} + 183160q_{27} + \\
& 183176q_{28} + 183160q_{29} + 183096q_{30} + 183128q_{31} + 183160q_{32} + 183160q_{33} + 183160q_{34} + 183160q_{35} + \\
& 183160q_{36} + 183264q_{37} + 183144q_{38} + 183144q_{39} + 183144q_{40} + 183144q_{41} + 183160q_{42} + 183144q_{43} + \\
& 183112q_{44} + 183112q_{45} + 183512q_{46} + 183448q_{47} + 183416q_{48} + 183288q_{49} + 183288q_{50} + 183288q_{51} + \\
& 183576q_{52} + 183448q_{53} + 183320q_{54} + 183352q_{55} + 183320q_{56} + 183512q_{57} + 183320q_{58} + 183352q_{59} + \\
& 183320q_{60} + 183288q_{61} + 183288q_{62} + 183288q_{63} + 183480q_{64} + 183480q_{65} + 183320q_{66} + 183480q_{67} + \\
& 183352q_{68} + 183480q_{69} + 61032q_0q_1 + 32q_0q_2 + 61032q_0q_3 + 61032q_1q_2 - 8q_0q_4 + 61032q_1q_3 + 61032q_0q_5 + \\
& 8q_1q_4 + 61032q_2q_3 + 61032q_0q_6 + 61032q_1q_5 + 61032q_2q_4 + 61032q_0q_7 + 61032q_1q_6 + 61032q_2q_5 + 61032q_3q_4 + \\
& 80q_0q_8 + 61032q_1q_7 + 61032q_2q_6 + 61032q_3q_5 + 61032q_0q_9 + 80q_1q_8 + 61032q_2q_7 + 61032q_3q_6 + 61032q_4q_5 + \\
& 61032q_0q_{10} + 61032q_1q_9 + 32q_2q_8 + 61032q_3q_7 + 16q_4q_6 + 61032q_0q_{11} + 61032q_1q_{10} + 61032q_2q_9 + 48q_3q_8 + \\
& 16q_4q_7 + 61032q_5q_6 + 48q_0q_{12} + 61032q_1q_{11} + 61032q_2q_{10} + 61032q_3q_9 + 16q_4q_8 + 61032q_5q_7 - 122064q_0q_{13} + \\
& 48q_1q_{12} + 61032q_2q_{11} + 61032q_3q_{10} + 61032q_4q_9 + 61032q_5q_8 + 61032q_6q_7 - 122064q_0q_{14} - 122064q_1q_{13} + \\
& 61032q_3q_{11} + 61032q_5q_9 + 61032q_6q_8 - 122064q_0q_{15} - 32q_2q_{13} + 16q_3q_{12} + 16q_4q_{11} + 61032q_5q_{10} + \\
& 61032q_6q_9 + 61032q_7q_8 - 122064q_0q_{16} - 32q_3q_{13} + 16q_4q_{12} + 61032q_5q_{11} + 61032q_6q_{10} + 61032q_7q_9 - \\
& 122064q_0q_{17} - 122064q_3q_{14} + 160q_5q_{12} + 61032q_6q_{11} + 61032q_7q_{10} + 61032q_8q_9 - 122064q_0q_{18} - 32q_4q_{14} - \\
& 64q_5q_{13} + 160q_6q_{12} + 61032q_7q_{11} + 61032q_8q_{10} - 122064q_0q_{19} - 64q_6q_{13} + 160q_7q_{12} + 61032q_8q_{11} + \\
& 61032q_9q_{10} - 122064q_0q_{20} - 122064q_5q_{15} - 64q_7q_{13} + 160q_8q_{12} + 61032q_9q_{11} - 64q_6q_{15} - 64q_8q_{13} + \\
& 61032q_9q_{12} + 61032q_{10}q_{11} - 122064q_1q_{21} - 122064q_6q_{16} - 64q_7q_{15} - 64q_9q_{13} + 61032q_{10}q_{12} - 122064q_1q_{22} - \\
& 122064q_2q_{21} - 64q_7q_{16} + 32q_8q_{15} - 64q_{10}q_{13} + 61032q_{11}q_{12} - 122064q_1q_{23} - 32q_3q_{21} - 122064q_7q_{17} - \\
& 64q_8q_{16} - 64q_{11}q_{13} - 122064q_1q_{24} - 122064q_3q_{22} + 32q_4q_{21} - 64q_8q_{17} - 32q_{12}q_{13} - 122064q_1q_{25} - \\
& 32q_4q_{22} - 122064q_1q_{26} - 122064q_9q_{18} - 122064q_1q_{27} - 122064q_5q_{23} - 64q_{10}q_{18} - 122064q_1q_{28} - 64q_6q_{23} - \\
& 122064q_{10}q_{19} - 64q_{11}q_{18} - 122064q_6q_{24} - 64q_{11}q_{19} + 32q_{12}q_{18} - 122064q_2q_{29} - 64q_7q_{24} - 32q_8q_{23} - \\
& 122064q_{11}q_{20} - 64q_{12}q_{19} - 122064q_2q_{30} - 122064q_3q_{29} - 122064q_7q_{25} - 64q_{12}q_{20} - 122064q_2q_{31} - \\
& 64q_4q_{29} - 64q_8q_{25} - 122064q_2q_{32} - 122064q_4q_{30} - 32q_5q_{29} - 122064q_2q_{33} + 32q_5q_{30} - 122064q_9q_{26} - \\
& 122064q_2q_{34} - 122064q_5q_{31} - 64q_{10}q_{26} - 122064q_2q_{35} - 64q_6q_{31} - 32q_8q_{29} - 122064q_{10}q_{27} - 122064q_2q_{36} - \\
& 122064q_6q_{32} + 32q_8q_{30} - 32q_9q_{29} - 64q_{11}q_{27} - 32q_{12}q_{26} - 64q_7q_{32} + 32q_9q_{30} - 122064q_{11}q_{28} - 122064q_3q_{37} - \\
& 122064q_7q_{33} - 32q_{11}q_{29} - 64q_{12}q_{28} - 122064q_3q_{38} - 122064q_4q_{37} - 64q_8q_{33} + 32q_{11}q_{30} - 122064q_3q_{39} - \\
& 64q_5q_{37} + 32q_{13}q_{29} - 122064q_3q_{40} - 122064q_5q_{38} - 64q_6q_{37} - 122064q_9q_{34} - 32q_{13}q_{30} - 122064q_3q_{41} - \\
& 64q_6q_{38} - 64q_7q_{37} - 64q_{10}q_{34} - 122064q_3q_{42} - 122064q_6q_{39} - 64q_8q_{37} - 122064q_{10}q_{35} - 122064q_3q_{43} - \\
& 64q_7q_{39} + 32q_8q_{38} - 64q_9q_{37} - 64q_{11}q_{35} - 122064q_7q_{40} - 64q_{10}q_{37} - 122064q_{11}q_{36} - 122064q_4q_{44} - 64q_8q_{40} - \\
& 64q_{11}q_{37} - 64q_{12}q_{36} - 122064q_4q_{45} - 122064q_5q_{44} - 32q_{12}q_{37} - 122064q_9q_{41} + 32q_{13}q_{37} - 122064q_5q_{46} - \\
& 64q_{10}q_{41} - 122064q_5q_{47} - 122064q_6q_{46} - 32q_8q_{44} - 122064q_{10}q_{42} - 122064q_5q_{48} - 256q_7q_{46} - 64q_{11}q_{42} + \\
& 32q_{12}q_{41} - 122064q_5q_{49} - 122064q_7q_{47} - 256q_8q_{46} - 122064q_9q_{45} - 122064q_{11}q_{43} - 122064q_5q_{50} - \\
& 256q_8q_{47} - 128q_9q_{46} - 64q_{12}q_{43} - 122064q_5q_{51} - 122064q_8q_{48} - 64q_9q_{47} - 128q_{10}q_{46} - 64q_9q_{48} - \\
& 128q_{10}q_{47} - 128q_{11}q_{46} - 32q_{12}q_{45} - 122064q_6q_{52} - 122064q_9q_{49} - 64q_{11}q_{47} - 64q_{12}q_{46} - 122064q_6q_{53} -
\end{aligned}$$

$$\begin{aligned}
& 122064q_7q_{52} - 128q_{10}q_{49} - 64q_{11}q_{48} - 64q_{12}q_{47} + 64q_{13}q_{46} - 122064q_6q_{54} - 256q_8q_{52} - 122064q_{10}q_{50} - \\
& 64q_{11}q_{49} - 64q_{12}q_{48} - 122064q_6q_{55} - 122064q_8q_{53} - 128q_9q_{52} - 128q_{11}q_{50} - 64q_{12}q_{49} - 122064q_6q_{56} - \\
& 64q_9q_{53} - 128q_{10}q_{52} - 122064q_{11}q_{51} - 64q_{12}q_{50} - 122064q_9q_{54} - 128q_{10}q_{53} - 128q_{11}q_{52} - 128q_{12}q_{51} - \\
& 122064q_7q_{57} - 128q_{10}q_{54} - 64q_{11}q_{53} - 64q_{12}q_{52} - 122064q_7q_{58} - 122064q_8q_{57} - 122064q_{10}q_{55} - 128q_{11}q_{54} - \\
& 64q_{12}q_{53} + 64q_{13}q_{52} - 122064q_7q_{59} - 128q_9q_{57} - 128q_{11}q_{55} - 64q_{12}q_{54} - 122064q_7q_{60} - 122064q_9q_{58} - \\
& 128q_{10}q_{57} - 122064q_{11}q_{56} - 128q_{12}q_{55} - 128q_{10}q_{58} - 128q_{11}q_{57} - 128q_{12}q_{56} - 122064q_8q_{61} - 122064q_{10}q_{59} - \\
& 128q_{11}q_{58} - 64q_{12}q_{57} - 122064q_8q_{62} - 122064q_9q_{61} - 128q_{11}q_{59} - 64q_{12}q_{58} + 64q_{13}q_{57} - 122064q_8q_{63} - \\
& 128q_{10}q_{61} - 122064q_{11}q_{60} - 128q_{12}q_{59} - 122064q_{10}q_{62} - 64q_{11}q_{61} - 128q_{12}q_{60} - 122064q_9q_{64} - 128q_{11}q_{62} - \\
& 64q_{12}q_{61} - 122064q_9q_{65} - 122064q_{10}q_{64} - 122064q_{11}q_{63} - 64q_{12}q_{62} - 122064q_9q_{66} - 256q_{11}q_{64} - 128q_{12}q_{63} + \\
& 64q_{29}q_{46} - 122064q_{11}q_{65} - 128q_{12}q_{64} - 64q_{29}q_{47} - 64q_{30}q_{46} - 122064q_{10}q_{67} - 256q_{12}q_{65} + 64q_{13}q_{64} + \\
& 64q_{30}q_{47} - 122064q_{10}q_{68} - 122064q_{11}q_{67} - 122064q_{12}q_{66} - 128q_{12}q_{67} - 122064q_{11}q_{69} - 122064q_{12}q_{68} + \\
& 64q_{13}q_{67} - 122064q_{12}q_{69} + 64q_{29}q_{52} + 64q_{13}q_{69} - 64q_{29}q_{53} - 64q_{30}q_{52} + 64q_{30}q_{53} + 64q_{37}q_{46} + 64q_{29}q_{57} - \\
& 64q_{30}q_{57} + 64q_{37}q_{52} + 64q_{29}q_{64} - 64q_{29}q_{65} - 64q_{30}q_{64} + 64q_{37}q_{57} + 64q_{30}q_{65} + 64q_{29}q_{67} - 64q_{29}q_{68} - \\
& 64q_{30}q_{67} + 64q_{29}q_{69} + 64q_{30}q_{68} - 64q_{30}q_{69} + 64q_{37}q_{64} + 256q_{46}q_{57} + 64q_{37}q_{67} + 64q_{37}q_{69} + 128q_{46}q_{64} + \\
& 128q_{47}q_{65} + 128q_{46}q_{67} + 128q_{48}q_{66} + 128q_{46}q_{69} + 128q_{47}q_{68} + 128q_{52}q_{64} + 128q_{53}q_{65} + 128q_{52}q_{67} + \\
& 128q_{52}q_{69} + 128q_{53}q_{68} + 128q_{57}q_{64} + 128q_{57}q_{67} + 128q_{57}q_{69} + 256q_{64}q_{69} + 948
\end{aligned}$$

A complete expression of $E_2(s)$ in 68-order H matrix using Turyn based method, using $\delta = 61, 032$.

$$\begin{aligned}
E_2(s) = & 122148s_0 + 137394s_1 + 137378s_2 + 152646s_3 + 61054s_4 + 168086s_5 + 152920s_6 + 153000s_7 + 92004s_8 + \\
& 183520s_9 + 168478s_{10} + 168626s_{11} + 46374s_{12} - 30568s_{13} - 30528s_{14} - 30532s_{15} - 30540s_{16} - 30556s_{17} - \\
& 30532s_{18} - 30548s_{19} - 30540s_{20} - 30532s_{21} - 30520s_{22} - 30532s_{23} - 30540s_{24} - 30540s_{25} - 30532s_{26} - \\
& 30532s_{27} - 30540s_{28} - 30540s_{29} - 30508s_{30} - 30516s_{31} - 30532s_{32} - 30532s_{33} - 30532s_{34} - 30532s_{35} - \\
& 30532s_{36} - 30584s_{37} - 30532s_{38} - 30524s_{39} - 30524s_{40} - 30532s_{41} - 30532s_{42} - 30524s_{43} - 30516s_{44} - \\
& 30516s_{45} - 30676s_{46} - 30612s_{47} - 30660s_{48} - 30548s_{49} - 30564s_{50} - 30580s_{51} - 30708s_{52} - 30676s_{53} - \\
& 30548s_{54} - 30580s_{55} - 30596s_{56} - 30804s_{57} - 30548s_{58} - 30580s_{59} - 30596s_{60} - 30548s_{61} - 30564s_{62} - \\
& 30580s_{63} - 30804s_{64} - 30708s_{65} - 30660s_{66} - 30804s_{67} - 30708s_{68} - 30900s_{69} + 15258s_0s_1 + 8s_0s_2 + 15258s_0s_3 + \\
& 15258s_1s_2 - 2s_0s_4 + 15258s_1s_3 + 15258s_0s_5 + 2s_1s_4 + 15258s_2s_3 + 15258s_0s_6 + 15258s_1s_5 + 15258s_2s_4 + \\
& 15258s_0s_7 + 15258s_1s_6 + 15258s_2s_5 + 15258s_3s_4 + 20s_0s_8 + 15258s_1s_7 + 15258s_2s_6 + 15258s_3s_5 + 15258s_0s_9 + \\
& 20s_1s_8 + 15258s_2s_7 + 15258s_3s_6 + 15258s_4s_5 + 15258s_0s_{10} + 15258s_1s_9 + 8s_2s_8 + 15258s_3s_7 + 4s_4s_6 + 15258s_0s_{11} + \\
& 15258s_1s_{10} + 15258s_2s_9 + 12s_3s_8 + 4s_4s_7 + 15258s_5s_6 + 12s_0s_{12} + 15258s_1s_{11} + 15258s_2s_{10} + 15258s_3s_9 + \\
& 4s_4s_8 + 15258s_5s_7 - 30516s_0s_{13} + 12s_1s_{12} + 15258s_2s_{11} + 15258s_3s_{10} + 15258s_4s_9 + 15258s_5s_8 + 15258s_6s_7 - \\
& 30516s_0s_{14} - 30516s_1s_{13} + 15258s_3s_{11} + 15258s_5s_9 + 15258s_6s_8 - 30516s_0s_{15} - 8s_2s_{13} + 4s_3s_{12} + 4s_4s_{11} + \\
& 15258s_5s_{10} + 15258s_6s_9 + 15258s_7s_8 - 30516s_0s_{16} - 8s_3s_{13} + 4s_4s_{12} + 15258s_5s_{11} + 15258s_6s_{10} + 15258s_7s_9 - \\
& 30516s_0s_{17} - 30516s_3s_{14} + 40s_5s_{12} + 15258s_6s_{11} + 15258s_7s_{10} + 15258s_8s_9 - 30516s_0s_{18} - 8s_4s_{14} - 16s_5s_{13} + \\
& 40s_6s_{12} + 15258s_7s_{11} + 15258s_8s_{10} - 30516s_0s_{19} - 16s_6s_{13} + 40s_7s_{12} + 15258s_8s_{11} + 15258s_9s_{10} - 30516s_0s_{20} - \\
& 30516s_5s_{15} - 16s_7s_{13} + 40s_8s_{12} + 15258s_9s_{11} - 16s_6s_{15} - 16s_8s_{13} + 15258s_9s_{12} + 15258s_{10}s_{11} - 30516s_1s_{21} - \\
& 30516s_6s_{16} - 16s_7s_{15} - 16s_9s_{13} + 15258s_{10}s_{12} - 30516s_1s_{22} - 30516s_2s_{21} - 16s_7s_{16} + 8s_8s_{15} - 16s_{10}s_{13} + \\
& 15258s_{11}s_{12} - 30516s_1s_{23} - 8s_3s_{21} - 30516s_7s_{17} - 16s_8s_{16} - 16s_{11}s_{13} - 30516s_1s_{24} - 30516s_3s_{22} + 8s_4s_{21} - \\
& 16s_8s_{17} - 8s_{12}s_{13} - 30516s_1s_{25} - 8s_4s_{22} - 30516s_1s_{26} - 30516s_9s_{18} - 30516s_1s_{27} - 30516s_5s_{23} - 16s_{10}s_{18} - \\
& 30516s_1s_{28} - 16s_6s_{23} - 30516s_{10}s_{19} - 16s_{11}s_{18} - 30516s_6s_{24} - 16s_{11}s_{19} + 8s_{12}s_{18} - 30516s_2s_{29} - 16s_7s_{24} - 8s_8s_{23} - \\
& 30516s_{11}s_{20} - 16s_{12}s_{19} - 30516s_2s_{30} - 30516s_3s_{29} - 30516s_7s_{25} - 16s_{12}s_{20} - 30516s_2s_{31} - 16s_4s_{29} - 16s_8s_{25} - \\
& 30516s_2s_{32} - 30516s_4s_{30} - 8s_5s_{29} - 30516s_2s_{33} + 8s_5s_{30} - 30516s_9s_{26} - 30516s_2s_{34} - 30516s_5s_{31} - 16s_{10}s_{26} - \\
& 30516s_2s_{35} - 16s_6s_{31} - 8s_8s_{29} - 30516s_{10}s_{27} - 30516s_2s_{36} - 30516s_6s_{32} + 8s_8s_{30} - 8s_9s_{29} - 16s_{11}s_{27} - 8s_{12}s_{26} - \\
& 16s_7s_{32} + 8s_9s_{30} - 30516s_{11}s_{28} - 30516s_3s_{37} - 30516s_7s_{33} - 8s_{11}s_{29} - 16s_{12}s_{28} - 30516s_3s_{38} - 30516s_4s_{37} - \\
& 16s_8s_{33} + 8s_{11}s_{30} - 30516s_3s_{39} - 16s_5s_{37} + 8s_{13}s_{29} - 30516s_3s_{40} - 30516s_5s_{38} - 16s_6s_{37} - 30516s_9s_{34} - 8s_{13}s_{30} - \\
& 30516s_3s_{41} - 16s_6s_{38} - 16s_7s_{37} - 16s_{10}s_{34} - 30516s_3s_{42} - 30516s_6s_{39} - 16s_8s_{37} - 30516s_{10}s_{35} - 30516s_3s_{43} - \\
& 16s_7s_{39} + 8s_8s_{38} - 16s_9s_{37} - 16s_{11}s_{35} - 30516s_7s_{40} - 16s_{10}s_{37} - 30516s_{11}s_{36} - 30516s_4s_{44} - 16s_8s_{40} - 16s_{11}s_{37} -
\end{aligned}$$

$$\begin{aligned}
& 16s_{12}s_{36} - 30516s_4s_{45} - 30516s_5s_{44} - 8s_{12}s_{37} - 30516s_9s_{41} + 8s_{13}s_{37} - 30516s_5s_{46} - 16s_{10}s_{41} - 30516s_5s_{47} - \\
& 30516s_6s_{46} - 8s_8s_{44} - 30516s_{10}s_{42} - 30516s_5s_{48} - 64s_7s_{46} - 16s_{11}s_{42} + 8s_{12}s_{41} - 30516s_5s_{49} - 30516s_7s_{47} - \\
& 64s_8s_{46} - 30516s_9s_{45} - 30516s_{11}s_{43} - 30516s_5s_{50} - 64s_8s_{47} - 32s_9s_{46} - 16s_{12}s_{43} - 30516s_5s_{51} - 30516s_8s_{48} - \\
& 16s_9s_{47} - 32s_{10}s_{46} - 16s_9s_{48} - 32s_{10}s_{47} - 32s_{11}s_{46} - 8s_{12}s_{45} - 30516s_6s_{52} - 30516s_9s_{49} - 16s_{11}s_{47} - 16s_{12}s_{46} - \\
& 30516s_6s_{53} - 30516s_7s_{52} - 32s_{10}s_{49} - 16s_{11}s_{48} - 16s_{12}s_{47} + 16s_{13}s_{46} - 30516s_6s_{54} - 64s_8s_{52} - 30516s_{10}s_{50} - \\
& 16s_{11}s_{49} - 16s_{12}s_{48} - 30516s_6s_{55} - 30516s_8s_{53} - 32s_9s_{52} - 32s_{11}s_{50} - 16s_{12}s_{49} - 30516s_6s_{56} - 16s_9s_{53} - 32s_{10}s_{52} - \\
& 30516s_{11}s_{51} - 16s_{12}s_{50} - 30516s_9s_{54} - 32s_{10}s_{53} - 32s_{11}s_{52} - 32s_{12}s_{51} - 30516s_7s_{57} - 32s_{10}s_{54} - 16s_{11}s_{53} - \\
& 16s_{12}s_{52} - 30516s_7s_{58} - 30516s_8s_{57} - 30516s_{10}s_{55} - 32s_{11}s_{54} - 16s_{12}s_{53} + 16s_{13}s_{52} - 30516s_7s_{59} - 32s_9s_{57} - \\
& 32s_{11}s_{55} - 16s_{12}s_{54} - 30516s_7s_{60} - 30516s_9s_{58} - 32s_{10}s_{57} - 30516s_{11}s_{56} - 32s_{12}s_{55} - 32s_{10}s_{58} - 32s_{11}s_{57} - \\
& 32s_{12}s_{56} - 30516s_8s_{61} - 30516s_{10}s_{59} - 32s_{11}s_{58} - 16s_{12}s_{57} - 30516s_8s_{62} - 30516s_9s_{61} - 32s_{11}s_{59} - 16s_{12}s_{58} + \\
& 16s_{13}s_{57} - 30516s_8s_{63} - 32s_{10}s_{61} - 30516s_{11}s_{60} - 32s_{12}s_{59} - 30516s_{10}s_{62} - 16s_{11}s_{61} - 32s_{12}s_{60} - 30516s_9s_{64} - \\
& 32s_{11}s_{62} - 16s_{12}s_{61} - 30516s_9s_{65} - 30516s_{10}s_{64} - 30516s_{11}s_{63} - 16s_{12}s_{62} - 30516s_9s_{66} - 64s_{11}s_{64} - 32s_{12}s_{63} + \\
& 16s_{29}s_{46} - 30516s_{11}s_{65} - 32s_{12}s_{64} - 16s_{29}s_{47} - 16s_{30}s_{46} - 30516s_{10}s_{67} - 64s_{12}s_{65} + 16s_{13}s_{64} + 16s_{30}s_{47} - \\
& 30516s_{10}s_{68} - 30516s_{11}s_{67} - 30516s_{12}s_{66} - 32s_{12}s_{67} - 30516s_{11}s_{69} - 30516s_{12}s_{68} + 16s_{13}s_{67} - 30516s_{12}s_{69} + \\
& 16s_{29}s_{52} + 16s_{13}s_{69} - 16s_{29}s_{53} - 16s_{30}s_{52} + 16s_{30}s_{53} + 16s_{37}s_{46} + 16s_{29}s_{57} - 16s_{30}s_{57} + 16s_{37}s_{52} + 16s_{29}s_{64} - \\
& 16s_{29}s_{65} - 16s_{30}s_{64} + 16s_{37}s_{57} + 16s_{30}s_{65} + 16s_{29}s_{67} - 16s_{29}s_{68} - 16s_{30}s_{67} + 16s_{29}s_{69} + 16s_{30}s_{68} - 16s_{30}s_{69} + \\
& 16s_{37}s_{64} + 64s_{46}s_{57} + 16s_{37}s_{67} + 16s_{37}s_{69} + 32s_{46}s_{64} + 32s_{47}s_{65} + 32s_{46}s_{67} + 32s_{48}s_{66} + 32s_{46}s_{69} + 32s_{47}s_{68} + \\
& 32s_{52}s_{64} + 32s_{53}s_{65} + 32s_{52}s_{67} + 32s_{52}s_{69} + 32s_{53}s_{68} + 32s_{57}s_{64} + 32s_{57}s_{67} + 32s_{57}s_{69} + 64s_{64}s_{69} + 2610926
\end{aligned}$$

A complete expression of $\hat{H}_2(\hat{\sigma}^z)$ in 68-order H matrix using Turyn based method, using $\delta = 61, 032$.

$$\begin{aligned}
\hat{H}_2(\hat{\sigma}^z) = & 122148\hat{\sigma}_0^z + 137394\hat{\sigma}_1^z + 137378\hat{\sigma}_2^z + 152646\hat{\sigma}_3^z + 61054\hat{\sigma}_4^z + 168086\hat{\sigma}_5^z + 152920\hat{\sigma}_6^z + 153000\hat{\sigma}_7^z + \\
& 92004\hat{\sigma}_8^z + 183520\hat{\sigma}_9^z + 168478\hat{\sigma}_{10}^z + 168626\hat{\sigma}_{11}^z + 46374\hat{\sigma}_{12}^z - 30568\hat{\sigma}_{13}^z - 30528\hat{\sigma}_{14}^z - 30532\hat{\sigma}_{15}^z - 30540\hat{\sigma}_{16}^z + \\
& 30556\hat{\sigma}_{17}^z - 30532\hat{\sigma}_{18}^z - 30548\hat{\sigma}_{19}^z - 30540\hat{\sigma}_{20}^z - 30532\hat{\sigma}_{21}^z - 30520\hat{\sigma}_{22}^z - 30532\hat{\sigma}_{23}^z - 30540\hat{\sigma}_{24}^z - 30540\hat{\sigma}_{25}^z - \\
& 30532\hat{\sigma}_{26}^z - 30532\hat{\sigma}_{27}^z - 30540\hat{\sigma}_{28}^z - 30540\hat{\sigma}_{29}^z - 30508\hat{\sigma}_{30}^z - 30516\hat{\sigma}_{31}^z - 30532\hat{\sigma}_{32}^z - 30532\hat{\sigma}_{33}^z - 30532\hat{\sigma}_{34}^z - \\
& 30532\hat{\sigma}_{35}^z - 30532\hat{\sigma}_{36}^z - 30584\hat{\sigma}_{37}^z - 30532\hat{\sigma}_{38}^z - 30524\hat{\sigma}_{39}^z - 30524\hat{\sigma}_{40}^z - 30532\hat{\sigma}_{41}^z - 30532\hat{\sigma}_{42}^z - 30524\hat{\sigma}_{43}^z - \\
& 30516\hat{\sigma}_{44}^z - 30516\hat{\sigma}_{45}^z - 30676\hat{\sigma}_{46}^z - 30612\hat{\sigma}_{47}^z - 30660\hat{\sigma}_{48}^z - 30548\hat{\sigma}_{49}^z - 30564\hat{\sigma}_{50}^z - 30580\hat{\sigma}_{51}^z - 30708\hat{\sigma}_{52}^z - \\
& 30676\hat{\sigma}_{53}^z - 30548\hat{\sigma}_{54}^z - 30580\hat{\sigma}_{55}^z - 30596\hat{\sigma}_{56}^z - 30804\hat{\sigma}_{57}^z - 30548\hat{\sigma}_{58}^z - 30580\hat{\sigma}_{59}^z - 30596\hat{\sigma}_{60}^z - 30548\hat{\sigma}_{61}^z - \\
& 30564\hat{\sigma}_{62}^z - 30580\hat{\sigma}_{63}^z - 30804\hat{\sigma}_{64}^z - 30708\hat{\sigma}_{65}^z - 30660\hat{\sigma}_{66}^z - 30804\hat{\sigma}_{67}^z - 30708\hat{\sigma}_{68}^z - 30900\hat{\sigma}_{69}^z + 15258\hat{\sigma}_0^z\hat{\sigma}_1^z + \\
& 8\hat{\sigma}_0^z\hat{\sigma}_2^z + 15258\hat{\sigma}_0^z\hat{\sigma}_3^z + 15258\hat{\sigma}_1^z\hat{\sigma}_2^z - 2\hat{\sigma}_0^z\hat{\sigma}_4^z + 15258\hat{\sigma}_1^z\hat{\sigma}_3^z + 15258\hat{\sigma}_0^z\hat{\sigma}_5^z + 2\hat{\sigma}_1^z\hat{\sigma}_4^z + 15258\hat{\sigma}_2^z\hat{\sigma}_3^z + 15258\hat{\sigma}_0^z\hat{\sigma}_6^z + \\
& 15258\hat{\sigma}_1^z\hat{\sigma}_5^z + 15258\hat{\sigma}_2^z\hat{\sigma}_4^z + 15258\hat{\sigma}_0^z\hat{\sigma}_7^z + 15258\hat{\sigma}_1^z\hat{\sigma}_6^z + 15258\hat{\sigma}_2^z\hat{\sigma}_5^z + 15258\hat{\sigma}_3^z\hat{\sigma}_4^z + 20\hat{\sigma}_0^z\hat{\sigma}_8^z + 15258\hat{\sigma}_1^z\hat{\sigma}_7^z + \\
& 15258\hat{\sigma}_2^z\hat{\sigma}_6^z + 15258\hat{\sigma}_3^z\hat{\sigma}_5^z + 15258\hat{\sigma}_0^z\hat{\sigma}_9^z + 20\hat{\sigma}_1^z\hat{\sigma}_8^z + 15258\hat{\sigma}_2^z\hat{\sigma}_7^z + 15258\hat{\sigma}_3^z\hat{\sigma}_6^z + 15258\hat{\sigma}_4^z\hat{\sigma}_5^z + 15258\hat{\sigma}_0^z\hat{\sigma}_{10}^z + \\
& 15258\hat{\sigma}_1^z\hat{\sigma}_9^z + 8\hat{\sigma}_2^z\hat{\sigma}_8^z + 15258\hat{\sigma}_3^z\hat{\sigma}_7^z + 4\hat{\sigma}_4^z\hat{\sigma}_6^z + 15258\hat{\sigma}_0^z\hat{\sigma}_{11}^z + 15258\hat{\sigma}_1^z\hat{\sigma}_{10}^z + 15258\hat{\sigma}_2^z\hat{\sigma}_9^z + 12\hat{\sigma}_3^z\hat{\sigma}_8^z + 4\hat{\sigma}_4^z\hat{\sigma}_7^z + \\
& 15258\hat{\sigma}_5^z\hat{\sigma}_6^z + 12\hat{\sigma}_0^z\hat{\sigma}_{12}^z + 15258\hat{\sigma}_1^z\hat{\sigma}_{11}^z + 15258\hat{\sigma}_2^z\hat{\sigma}_{10}^z + 15258\hat{\sigma}_3^z\hat{\sigma}_9^z + 4\hat{\sigma}_4^z\hat{\sigma}_8^z + 15258\hat{\sigma}_5^z\hat{\sigma}_7^z - 30516\hat{\sigma}_0^z\hat{\sigma}_{13}^z + \\
& 12\hat{\sigma}_1^z\hat{\sigma}_{12}^z + 15258\hat{\sigma}_2^z\hat{\sigma}_{11}^z + 15258\hat{\sigma}_3^z\hat{\sigma}_{10}^z + 15258\hat{\sigma}_4^z\hat{\sigma}_9^z + 15258\hat{\sigma}_5^z\hat{\sigma}_8^z + 15258\hat{\sigma}_6^z\hat{\sigma}_7^z - 30516\hat{\sigma}_0^z\hat{\sigma}_{14}^z - 30516\hat{\sigma}_1^z\hat{\sigma}_{13}^z + \\
& 15258\hat{\sigma}_3^z\hat{\sigma}_{11}^z + 15258\hat{\sigma}_5^z\hat{\sigma}_9^z + 15258\hat{\sigma}_6^z\hat{\sigma}_8^z - 30516\hat{\sigma}_0^z\hat{\sigma}_{15}^z - 8\hat{\sigma}_2^z\hat{\sigma}_{13}^z + 4\hat{\sigma}_3^z\hat{\sigma}_{12}^z + 4\hat{\sigma}_4^z\hat{\sigma}_{11}^z + 15258\hat{\sigma}_5^z\hat{\sigma}_{10}^z + \\
& 15258\hat{\sigma}_6^z\hat{\sigma}_9^z + 15258\hat{\sigma}_7^z\hat{\sigma}_8^z - 30516\hat{\sigma}_0^z\hat{\sigma}_{16}^z - 8\hat{\sigma}_3^z\hat{\sigma}_{13}^z + 4\hat{\sigma}_4^z\hat{\sigma}_{12}^z + 15258\hat{\sigma}_5^z\hat{\sigma}_{11}^z + 15258\hat{\sigma}_6^z\hat{\sigma}_{10}^z + 15258\hat{\sigma}_7^z\hat{\sigma}_9^z - \\
& 30516\hat{\sigma}_0^z\hat{\sigma}_{17}^z - 30516\hat{\sigma}_3^z\hat{\sigma}_{14}^z + 40\hat{\sigma}_5^z\hat{\sigma}_{12}^z + 15258\hat{\sigma}_6^z\hat{\sigma}_{11}^z + 15258\hat{\sigma}_7^z\hat{\sigma}_{10}^z + 15258\hat{\sigma}_8^z\hat{\sigma}_9^z - 30516\hat{\sigma}_0^z\hat{\sigma}_{18}^z - 8\hat{\sigma}_4^z\hat{\sigma}_{14}^z - \\
& 16\hat{\sigma}_5^z\hat{\sigma}_{13}^z + 40\hat{\sigma}_6^z\hat{\sigma}_{12}^z + 15258\hat{\sigma}_7^z\hat{\sigma}_{11}^z + 15258\hat{\sigma}_8^z\hat{\sigma}_{10}^z - 30516\hat{\sigma}_0^z\hat{\sigma}_{19}^z - 16\hat{\sigma}_6^z\hat{\sigma}_{13}^z + 40\hat{\sigma}_7^z\hat{\sigma}_{12}^z + 15258\hat{\sigma}_8^z\hat{\sigma}_{11}^z + \\
& 15258\hat{\sigma}_9^z\hat{\sigma}_{10}^z - 30516\hat{\sigma}_0^z\hat{\sigma}_{20}^z - 30516\hat{\sigma}_5^z\hat{\sigma}_{15}^z - 16\hat{\sigma}_7^z\hat{\sigma}_{13}^z + 40\hat{\sigma}_8^z\hat{\sigma}_{12}^z + 15258\hat{\sigma}_9^z\hat{\sigma}_{11}^z - 16\hat{\sigma}_6^z\hat{\sigma}_{15}^z - 16\hat{\sigma}_8^z\hat{\sigma}_{13}^z + \\
& 15258\hat{\sigma}_9^z\hat{\sigma}_{12}^z + 15258\hat{\sigma}_{10}^z\hat{\sigma}_{11}^z - 30516\hat{\sigma}_1^z\hat{\sigma}_{21}^z - 30516\hat{\sigma}_6^z\hat{\sigma}_{16}^z - 16\hat{\sigma}_7^z\hat{\sigma}_{15}^z - 16\hat{\sigma}_9^z\hat{\sigma}_{13}^z + 15258\hat{\sigma}_{10}^z\hat{\sigma}_{12}^z - 30516\hat{\sigma}_1^z\hat{\sigma}_{22}^z - \\
& 30516\hat{\sigma}_2^z\hat{\sigma}_{21}^z - 16\hat{\sigma}_7^z\hat{\sigma}_{16}^z + 8\hat{\sigma}_8^z\hat{\sigma}_{15}^z - 16\hat{\sigma}_{10}^z\hat{\sigma}_{13}^z + 15258\hat{\sigma}_{11}^z\hat{\sigma}_{12}^z - 30516\hat{\sigma}_1^z\hat{\sigma}_{23}^z - 8\hat{\sigma}_3^z\hat{\sigma}_{21}^z - 30516\hat{\sigma}_7^z\hat{\sigma}_{17}^z - \\
& 16\hat{\sigma}_8^z\hat{\sigma}_{16}^z - 16\hat{\sigma}_{11}^z\hat{\sigma}_{13}^z - 30516\hat{\sigma}_7^z\hat{\sigma}_{24}^z - 30516\hat{\sigma}_3^z\hat{\sigma}_{22}^z + 8\hat{\sigma}_4^z\hat{\sigma}_{21}^z - 16\hat{\sigma}_8^z\hat{\sigma}_{17}^z - 8\hat{\sigma}_{12}^z\hat{\sigma}_{13}^z - 30516\hat{\sigma}_1^z\hat{\sigma}_{25}^z - 8\hat{\sigma}_4^z\hat{\sigma}_{22}^z - \\
& 30516\hat{\sigma}_7^z\hat{\sigma}_{26}^z - 30516\hat{\sigma}_9^z\hat{\sigma}_{18}^z - 30516\hat{\sigma}_1^z\hat{\sigma}_{27}^z - 30516\hat{\sigma}_5^z\hat{\sigma}_{23}^z - 16\hat{\sigma}_{10}^z\hat{\sigma}_{18}^z - 30516\hat{\sigma}_1^z\hat{\sigma}_{28}^z - 16\hat{\sigma}_6^z\hat{\sigma}_{23}^z - 30516\hat{\sigma}_{10}^z\hat{\sigma}_{19}^z - \\
& 16\hat{\sigma}_{11}^z\hat{\sigma}_{18}^z - 30516\hat{\sigma}_6^z\hat{\sigma}_{24}^z - 16\hat{\sigma}_{11}^z\hat{\sigma}_{19}^z + 8\hat{\sigma}_{12}^z\hat{\sigma}_{18}^z - 30516\hat{\sigma}_2^z\hat{\sigma}_{29}^z - 16\hat{\sigma}_7^z\hat{\sigma}_{24}^z - 8\hat{\sigma}_8^z\hat{\sigma}_{23}^z - 30516\hat{\sigma}_{11}^z\hat{\sigma}_{20}^z - 16\hat{\sigma}_{12}^z\hat{\sigma}_{19}^z - \\
& 30516\hat{\sigma}_2^z\hat{\sigma}_{30}^z - 30516\hat{\sigma}_3^z\hat{\sigma}_{29}^z - 30516\hat{\sigma}_7^z\hat{\sigma}_{25}^z - 16\hat{\sigma}_{12}^z\hat{\sigma}_{20}^z - 30516\hat{\sigma}_2^z\hat{\sigma}_{31}^z - 16\hat{\sigma}_4^z\hat{\sigma}_{29}^z - 16\hat{\sigma}_8^z\hat{\sigma}_{25}^z - 30516\hat{\sigma}_2^z\hat{\sigma}_{32}^z - \\
& 30516\hat{\sigma}_4^z\hat{\sigma}_{30}^z - 8\hat{\sigma}_5^z\hat{\sigma}_{29}^z - 30516\hat{\sigma}_2^z\hat{\sigma}_{33}^z + 8\hat{\sigma}_5^z\hat{\sigma}_{30}^z - 30516\hat{\sigma}_9^z\hat{\sigma}_{26}^z - 30516\hat{\sigma}_2^z\hat{\sigma}_{34}^z - 30516\hat{\sigma}_5^z\hat{\sigma}_{31}^z - 16\hat{\sigma}_{10}^z\hat{\sigma}_{26}^z - \\
& 30516\hat{\sigma}_2^z\hat{\sigma}_{35}^z - 16\hat{\sigma}_6^z\hat{\sigma}_{31}^z - 8\hat{\sigma}_8^z\hat{\sigma}_{29}^z - 30516\hat{\sigma}_{10}^z\hat{\sigma}_{27}^z - 30516\hat{\sigma}_2^z\hat{\sigma}_{36}^z - 30516\hat{\sigma}_6^z\hat{\sigma}_{32}^z + 8\hat{\sigma}_8^z\hat{\sigma}_{30}^z - 8\hat{\sigma}_9^z\hat{\sigma}_{29}^z - 16\hat{\sigma}_{11}^z\hat{\sigma}_{27}^z -
\end{aligned}$$

$$\begin{aligned}
& 8\hat{\sigma}_{12,26}^2 - 16\hat{\sigma}_7^2\hat{\sigma}_{32}^2 + 8\hat{\sigma}_9^2\hat{\sigma}_{30}^2 - 30516\hat{\sigma}_{11,28}^2 - 30516\hat{\sigma}_3^2\hat{\sigma}_{37}^2 - 30516\hat{\sigma}_7^2\hat{\sigma}_{33}^2 - 8\hat{\sigma}_{11,29}^2 - 16\hat{\sigma}_{12,28}^2 - 30516\hat{\sigma}_3^2\hat{\sigma}_{38}^2 - \\
& 30516\hat{\sigma}_4^2\hat{\sigma}_{37}^2 - 16\hat{\sigma}_8^2\hat{\sigma}_{33}^2 + 8\hat{\sigma}_{11,30}^2 - 30516\hat{\sigma}_3^2\hat{\sigma}_{39}^2 - 16\hat{\sigma}_5^2\hat{\sigma}_{37}^2 + 8\hat{\sigma}_{13,29}^2 - 30516\hat{\sigma}_3^2\hat{\sigma}_{40}^2 - 30516\hat{\sigma}_5^2\hat{\sigma}_{38}^2 - 16\hat{\sigma}_6^2\hat{\sigma}_{37}^2 - \\
& 30516\hat{\sigma}_9^2\hat{\sigma}_{34}^2 - 8\hat{\sigma}_{13,30}^2 - 30516\hat{\sigma}_3^2\hat{\sigma}_{41}^2 - 16\hat{\sigma}_6^2\hat{\sigma}_{38}^2 - 16\hat{\sigma}_7^2\hat{\sigma}_{37}^2 - 16\hat{\sigma}_{10,34}^2 - 30516\hat{\sigma}_3^2\hat{\sigma}_{42}^2 - 30516\hat{\sigma}_6^2\hat{\sigma}_{39}^2 - \\
& 16\hat{\sigma}_8^2\hat{\sigma}_{37}^2 - 30516\hat{\sigma}_{10,35}^2 - 30516\hat{\sigma}_3^2\hat{\sigma}_{43}^2 - 16\hat{\sigma}_7^2\hat{\sigma}_{39}^2 + 8\hat{\sigma}_8^2\hat{\sigma}_{38}^2 - 16\hat{\sigma}_9^2\hat{\sigma}_{37}^2 - 16\hat{\sigma}_{11,35}^2 - 30516\hat{\sigma}_7^2\hat{\sigma}_{40}^2 - 16\hat{\sigma}_{10}^2\hat{\sigma}_{37}^2 - \\
& 30516\hat{\sigma}_{11}^2\hat{\sigma}_{36}^2 - 30516\hat{\sigma}_4^2\hat{\sigma}_{44}^2 - 16\hat{\sigma}_8^2\hat{\sigma}_{40}^2 - 16\hat{\sigma}_{11,37}^2 - 16\hat{\sigma}_{12,36}^2 - 30516\hat{\sigma}_4^2\hat{\sigma}_{45}^2 - 30516\hat{\sigma}_5^2\hat{\sigma}_{44}^2 - 8\hat{\sigma}_{12,37}^2 - \\
& 30516\hat{\sigma}_9^2\hat{\sigma}_{41}^2 + 8\hat{\sigma}_{13,37}^2 - 30516\hat{\sigma}_5^2\hat{\sigma}_{46}^2 - 16\hat{\sigma}_{10}^2\hat{\sigma}_{41}^2 - 30516\hat{\sigma}_5^2\hat{\sigma}_{47}^2 - 30516\hat{\sigma}_6^2\hat{\sigma}_{46}^2 - 8\hat{\sigma}_8^2\hat{\sigma}_{44}^2 - 30516\hat{\sigma}_{10}^2\hat{\sigma}_{42}^2 - \\
& 30516\hat{\sigma}_5^2\hat{\sigma}_{48}^2 - 64\hat{\sigma}_7^2\hat{\sigma}_{46}^2 - 16\hat{\sigma}_{11}^2\hat{\sigma}_{42}^2 + 8\hat{\sigma}_{12,41}^2 - 30516\hat{\sigma}_5^2\hat{\sigma}_{49}^2 - 30516\hat{\sigma}_6^2\hat{\sigma}_{47}^2 - 64\hat{\sigma}_8^2\hat{\sigma}_{46}^2 - 30516\hat{\sigma}_9^2\hat{\sigma}_{45}^2 - \\
& 30516\hat{\sigma}_{11}^2\hat{\sigma}_{43}^2 - 30516\hat{\sigma}_5^2\hat{\sigma}_{50}^2 - 64\hat{\sigma}_8^2\hat{\sigma}_{47}^2 - 32\hat{\sigma}_9^2\hat{\sigma}_{46}^2 - 16\hat{\sigma}_{12,43}^2 - 30516\hat{\sigma}_5^2\hat{\sigma}_{51}^2 - 30516\hat{\sigma}_8^2\hat{\sigma}_{48}^2 - 16\hat{\sigma}_9^2\hat{\sigma}_{47}^2 - \\
& 32\hat{\sigma}_{10,46}^2 - 16\hat{\sigma}_9^2\hat{\sigma}_{48}^2 - 32\hat{\sigma}_{10}^2\hat{\sigma}_{47}^2 - 32\hat{\sigma}_{11}^2\hat{\sigma}_{46}^2 - 8\hat{\sigma}_{12,45}^2 - 30516\hat{\sigma}_6^2\hat{\sigma}_{52}^2 - 30516\hat{\sigma}_9^2\hat{\sigma}_{49}^2 - 16\hat{\sigma}_{11,47}^2 - 16\hat{\sigma}_{12,46}^2 - \\
& 30516\hat{\sigma}_6^2\hat{\sigma}_{53}^2 - 30516\hat{\sigma}_7^2\hat{\sigma}_{52}^2 - 32\hat{\sigma}_{10}^2\hat{\sigma}_{49}^2 - 16\hat{\sigma}_{11}^2\hat{\sigma}_{48}^2 - 16\hat{\sigma}_{12,47}^2 + 16\hat{\sigma}_{13,46}^2 - 30516\hat{\sigma}_6^2\hat{\sigma}_{54}^2 - 64\hat{\sigma}_8^2\hat{\sigma}_{52}^2 - \\
& 30516\hat{\sigma}_{10}^2\hat{\sigma}_{50}^2 - 16\hat{\sigma}_{11,49}^2 - 16\hat{\sigma}_{12,48}^2 - 30516\hat{\sigma}_6^2\hat{\sigma}_{55}^2 - 30516\hat{\sigma}_8^2\hat{\sigma}_{53}^2 - 32\hat{\sigma}_9^2\hat{\sigma}_{52}^2 - 32\hat{\sigma}_{11}^2\hat{\sigma}_{50}^2 - 16\hat{\sigma}_{12,49}^2 - \\
& 30516\hat{\sigma}_6^2\hat{\sigma}_{56}^2 - 16\hat{\sigma}_9^2\hat{\sigma}_{53}^2 - 32\hat{\sigma}_{10}^2\hat{\sigma}_{52}^2 - 30516\hat{\sigma}_{11}^2\hat{\sigma}_{51}^2 - 16\hat{\sigma}_{12,50}^2 - 30516\hat{\sigma}_9^2\hat{\sigma}_{54}^2 - 32\hat{\sigma}_{10}^2\hat{\sigma}_{53}^2 - 32\hat{\sigma}_{11}^2\hat{\sigma}_{52}^2 - \\
& 32\hat{\sigma}_{12,51}^2 - 30516\hat{\sigma}_7^2\hat{\sigma}_{57}^2 - 32\hat{\sigma}_{10}^2\hat{\sigma}_{54}^2 - 16\hat{\sigma}_{11}^2\hat{\sigma}_{53}^2 - 16\hat{\sigma}_{12,52}^2 - 30516\hat{\sigma}_7^2\hat{\sigma}_{58}^2 - 30516\hat{\sigma}_8^2\hat{\sigma}_{57}^2 - 30516\hat{\sigma}_9^2\hat{\sigma}_{55}^2 - \\
& 32\hat{\sigma}_{11,54}^2 - 16\hat{\sigma}_{12,53}^2 + 16\hat{\sigma}_{13,52}^2 - 30516\hat{\sigma}_7^2\hat{\sigma}_{59}^2 - 32\hat{\sigma}_9^2\hat{\sigma}_{57}^2 - 32\hat{\sigma}_{11}^2\hat{\sigma}_{55}^2 - 16\hat{\sigma}_{12,54}^2 - 30516\hat{\sigma}_7^2\hat{\sigma}_{60}^2 - 30516\hat{\sigma}_9^2\hat{\sigma}_{58}^2 - \\
& 32\hat{\sigma}_{10,57}^2 - 30516\hat{\sigma}_{11}^2\hat{\sigma}_{56}^2 - 32\hat{\sigma}_{12,55}^2 - 32\hat{\sigma}_{10}^2\hat{\sigma}_{58}^2 - 32\hat{\sigma}_{11}^2\hat{\sigma}_{57}^2 - 32\hat{\sigma}_{12,56}^2 - 30516\hat{\sigma}_8^2\hat{\sigma}_{61}^2 - 30516\hat{\sigma}_{10}^2\hat{\sigma}_{59}^2 - \\
& 32\hat{\sigma}_{11}^2\hat{\sigma}_{58}^2 - 16\hat{\sigma}_{12,57}^2 - 30516\hat{\sigma}_8^2\hat{\sigma}_{62}^2 - 30516\hat{\sigma}_9^2\hat{\sigma}_{61}^2 - 32\hat{\sigma}_{11}^2\hat{\sigma}_{59}^2 - 16\hat{\sigma}_{12,58}^2 + 16\hat{\sigma}_{13,57}^2 - 30516\hat{\sigma}_8^2\hat{\sigma}_{63}^2 - \\
& 32\hat{\sigma}_{10,61}^2 - 30516\hat{\sigma}_{11}^2\hat{\sigma}_{60}^2 - 32\hat{\sigma}_{12,59}^2 - 30516\hat{\sigma}_{10}^2\hat{\sigma}_{62}^2 - 16\hat{\sigma}_{11}^2\hat{\sigma}_{61}^2 - 32\hat{\sigma}_{12,60}^2 - 30516\hat{\sigma}_9^2\hat{\sigma}_{64}^2 - 32\hat{\sigma}_{11}^2\hat{\sigma}_{62}^2 - \\
& 16\hat{\sigma}_{12,61}^2 - 30516\hat{\sigma}_9^2\hat{\sigma}_{65}^2 - 30516\hat{\sigma}_{10}^2\hat{\sigma}_{64}^2 - 30516\hat{\sigma}_{11}^2\hat{\sigma}_{63}^2 - 16\hat{\sigma}_{12,62}^2 - 30516\hat{\sigma}_9^2\hat{\sigma}_{66}^2 - 64\hat{\sigma}_{11}^2\hat{\sigma}_{64}^2 - 32\hat{\sigma}_{12}^2\hat{\sigma}_{63}^2 + \\
& 16\hat{\sigma}_{29,46}^2 - 30516\hat{\sigma}_{11}^2\hat{\sigma}_{65}^2 - 32\hat{\sigma}_{12,64}^2 - 16\hat{\sigma}_{29,47}^2 - 16\hat{\sigma}_{30,46}^2 - 30516\hat{\sigma}_{10}^2\hat{\sigma}_{67}^2 - 64\hat{\sigma}_{12,65}^2 + 16\hat{\sigma}_{13,64}^2 + \\
& 16\hat{\sigma}_{30,47}^2 - 30516\hat{\sigma}_{10}^2\hat{\sigma}_{68}^2 - 30516\hat{\sigma}_{11}^2\hat{\sigma}_{67}^2 - 30516\hat{\sigma}_{12}^2\hat{\sigma}_{66}^2 - 32\hat{\sigma}_{12,67}^2 - 30516\hat{\sigma}_{11}^2\hat{\sigma}_{69}^2 - 30516\hat{\sigma}_{12}^2\hat{\sigma}_{68}^2 + \\
& 16\hat{\sigma}_{13,67}^2 - 30516\hat{\sigma}_{12}^2\hat{\sigma}_{69}^2 + 16\hat{\sigma}_{29,52}^2 + 16\hat{\sigma}_{13,69}^2 - 16\hat{\sigma}_{29,53}^2 - 16\hat{\sigma}_{30,52}^2 + 16\hat{\sigma}_{30,53}^2 + 16\hat{\sigma}_{37,46}^2 + 16\hat{\sigma}_{29,57}^2 - \\
& 16\hat{\sigma}_{30,57}^2 + 16\hat{\sigma}_{37,52}^2 + 16\hat{\sigma}_{29,64}^2 - 16\hat{\sigma}_{29,65}^2 - 16\hat{\sigma}_{30,64}^2 + 16\hat{\sigma}_{37,57}^2 + 16\hat{\sigma}_{30,65}^2 + 16\hat{\sigma}_{29,67}^2 - 16\hat{\sigma}_{29,68}^2 - \\
& 16\hat{\sigma}_{30,67}^2 + 16\hat{\sigma}_{29,69}^2 + 16\hat{\sigma}_{30,6$$

Complete expressions for Turyn type H-matrix of order 92

A complete expression of $E_k(s)$ in 92-order H matrix using Turyn based method

$$\begin{aligned}
 H_k(s) = & 2s_0 + 4s_2 + 2s_3 - 4s_4 + 4s_5 - 2s_6 + 2s_7 - 4s_8 + 8s_9 + 8s_{10} + 8s_{11} + 8s_{12} + 8s_{13} + 8s_{14} + 8s_{16} + 8s_{18} + 8s_{20} + \\
 & 6s_0s_2 + 4s_0s_4 - 2s_1s_3 + 4s_0s_5 - 2s_0s_6 + 2s_1s_5 + 2s_0s_7 + 6s_1s_6 + 2s_2s_5 + 4s_3s_4 - 4s_0s_8 - 6s_1s_7 - 2s_2s_6 - 4s_3s_5 + 4s_0s_9 - \\
 & 2s_1s_8 + 2s_2s_7 - 2s_3s_6 - 2s_4s_5 - 2s_2s_8 + 2s_3s_7 + 2s_4s_6 + 4s_0s_{11} + 4s_1s_{10} + 4s_3s_8 - 2s_4s_7 + 4s_0s_{12} + 4s_1s_{11} + 4s_2s_{10} + \\
 & 4s_3s_9 + 2s_4s_8 + 2s_5s_7 + 4s_1s_{12} + 4s_2s_{11} - 8s_5s_8 - 8s_6s_7 + 4s_0s_{14} + 4s_1s_{13} + 4s_2s_{12} + 4s_3s_{11} + 2s_6s_8 + 4s_0s_{15} + 4s_2s_{13} + \\
 & 4s_3s_{12} + 4s_0s_{16} + 4s_1s_{16} + 4s_3s_{14} + 4s_0s_{18} + 8s_1s_{17} + 4s_2s_{16} + 4s_3s_{15} - 4s_0s_{19} - 4s_1s_{18} - 4s_3s_{16} + 8s_4s_{15} + 4s_2s_{18} + \\
 & 8s_9s_{11} + 4s_3s_{18} + 4s_5s_{16} + 4s_3s_{19} + 8s_9s_{13} + 8s_{10}s_{12} + 4s_6s_{17} + 16s_9s_{14} + 16s_{10}s_{13} + 16s_{11}s_{12} - 8s_4s_{20} - 4s_5s_{19} - \\
 & 4s_6s_{18} - 4s_7s_{17} - 4s_8s_{16} + 8s_9s_{15} + 8s_{10}s_{14} + 8s_{11}s_{13} + 4s_7s_{18} + 8s_{10}s_{16} + 8s_{12}s_{14} + 4s_8s_{19} + 8s_{11}s_{17} + 8s_9s_{20} + \\
 & 8s_{10}s_{19} + 8s_{11}s_{18} + 8s_{12}s_{17} + 8s_{13}s_{16} + 8s_{14}s_{15} + 8s_{12}s_{18} + 8s_{13}s_{19} + 8s_{15}s_{17} + 8s_{14}s_{20} + 8s_{15}s_{19} + 8s_{16}s_{18} + 8s_{16}s_{20} + \\
 & 8s_{17}s_{19} + 8s_{18}s_{20} + 4s_0s_1s_2 + 8s_0s_1s_3 + 4s_0s_1s_4 + 4s_1s_2s_3 + 2s_0s_2s_5 + 4s_1s_2s_4 + 2s_0s_3s_6 + 2s_1s_3s_5 + 4s_2s_3s_4 + 4s_0s_1s_9 - \\
 & 2s_0s_2s_8 - 2s_0s_3s_7 + 2s_0s_4s_6 + 2s_1s_4s_5 - 2s_0s_4s_7 + 2s_0s_5s_6 - 2s_1s_4s_6 - 2s_2s_4s_5 + 4s_0s_2s_{10} + 2s_0s_5s_7 + 4s_1s_2s_9 - \\
 & 2s_1s_3s_8 + 2s_1s_4s_7 + 2s_2s_4s_6 + 2s_0s_6s_7 - 2s_1s_4s_8 + 2s_1s_5s_7 - 2s_2s_4s_7 - 2s_3s_4s_6 + 4s_0s_3s_{11} + 2s_0s_6s_8 + 4s_1s_3s_{10} + \\
 & 4s_1s_5s_8 + 4s_2s_3s_9 + 2s_2s_4s_8 + 2s_2s_5s_7 + 2s_3s_4s_7 + 2s_3s_5s_6 + 4s_0s_1s_{14} + 4s_0s_2s_{13} + 4s_0s_3s_{12} + 2s_0s_7s_8 + 2s_1s_6s_8 - \\
 & 2s_3s_5s_7 + 8s_4s_5s_6 + 4s_0s_1s_{15} + 2s_2s_6s_8 + 2s_3s_6s_7 - 4s_4s_5s_7 + 4s_1s_2s_{14} + 4s_1s_3s_{13} - 2s_3s_6s_8 + 8s_4s_6s_7 + 4s_0s_2s_{16} + \\
 & 4s_1s_2s_{15} + 2s_3s_7s_8 + 4s_4s_5s_9 - 4s_4s_6s_8 + 4s_0s_9s_{10} + 4s_2s_3s_{14} + 8s_4s_7s_8 + 4s_5s_6s_8 + 4s_0s_3s_{17} + 4s_0s_9s_{11} + 4s_1s_3s_{16} + \\
 & 4s_2s_3s_{15} - 4s_4s_5s_{11} + 4s_4s_6s_{10} + 4s_5s_6s_9 - 4s_5s_7s_8 + 4s_0s_{10}s_{11} + 4s_1s_9s_{11} - 4s_4s_5s_{12} - 4s_4s_6s_{11} - 4s_4s_7s_{10} - \\
 & 4s_4s_8s_9 + 4s_0s_9s_{13} + 4s_0s_{10}s_{12} + 8s_1s_9s_{12} + 4s_2s_9s_{11} + 4s_3s_9s_{10} - 4s_4s_6s_{12} + 4s_4s_7s_{11} + 4s_5s_7s_{10} + 4s_6s_7s_9 - \\
 & 4s_0s_9s_{14} + 4s_0s_{11}s_{12} - 4s_1s_9s_{13} + 4s_1s_{10}s_{12} - 4s_3s_9s_{11} + 4s_4s_5s_{14} + 4s_4s_6s_{13} + 4s_4s_7s_{12} + 4s_4s_8s_{11} + 8s_4s_9s_{10} + \\
 & 4s_0s_{10}s_{14} + 4s_0s_{11}s_{13} + 8s_1s_{10}s_{13} + 4s_2s_9s_{13} + 4s_2s_{10}s_{12} + 4s_3s_{10}s_{11} + 4s_4s_5s_{15} - 4s_4s_7s_{13} + 4s_4s_8s_{12} + 4s_5s_8s_{11} + \\
 & 4s_6s_8s_{10} + 4s_7s_8s_9 + 4s_0s_{12}s_{13} - 4s_1s_{10}s_{14} + 4s_1s_{11}s_{13} + 4s_3s_9s_{13} - 4s_3s_{10}s_{12} + 8s_4s_{10}s_{11} + 4s_5s_6s_{14} + 4s_5s_7s_{13} + \\
 & 4s_5s_8s_{12} + 4s_5s_9s_{11} + 4s_0s_{12}s_{14} + 8s_1s_{11}s_{14} + 4s_2s_{10}s_{14} + 4s_2s_{11}s_{13} + 4s_3s_9s_{14} + 4s_3s_{11}s_{12} + 4s_4s_6s_{16} - 4s_4s_8s_{14} + \\
 & 4s_5s_6s_{15} + 4s_0s_{13}s_{14} + 4s_1s_{12}s_{14} + 4s_3s_{10}s_{14} - 4s_3s_{11}s_{13} - 4s_4s_5s_{18} - 4s_4s_6s_{17} - 4s_4s_7s_{16} - 4s_4s_8s_{15} + 8s_4s_{11}s_{12} + \\
 & 4s_5s_{10}s_{12} + 4s_6s_7s_{14} + 4s_6s_8s_{13} + 4s_6s_9s_{12} + 4s_2s_{12}s_{14} + 4s_3s_{12}s_{13} + 4s_4s_7s_{17} + 4s_5s_7s_{16} - 4s_5s_9s_{14} + 4s_6s_7s_{15} - \\
 & 4s_6s_9s_{13} - 4s_7s_9s_{12} - 4s_8s_9s_{11} - 4s_3s_{12}s_{14} + 8s_4s_{12}s_{13} + 4s_5s_{11}s_{13} + 4s_6s_{10}s_{13} + 4s_7s_8s_{14} + 4s_7s_9s_{13} + 4s_3s_{13}s_{14} + \\
 & 4s_4s_8s_{18} + 4s_5s_8s_{17} + 4s_6s_8s_{16} - 4s_6s_{10}s_{14} + 4s_7s_8s_{15} - 4s_7s_{10}s_{13} - 4s_8s_{10}s_{12} + 16s_9s_{10}s_{11} + 4s_0s_{15}s_{16} + 8s_4s_{13}s_{14} + \\
 & 4s_5s_{12}s_{14} + 4s_6s_{11}s_{14} + 4s_7s_{10}s_{14} + 4s_8s_9s_{14} + 4s_0s_{15}s_{17} - 4s_7s_{11}s_{14} - 4s_8s_{11}s_{13} + 16s_9s_{11}s_{12} + 4s_0s_{16}s_{17} + \\
 & 4s_1s_{15}s_{17} + 16s_9s_{10}s_{14} + 16s_9s_{11}s_{13} + 4s_0s_{15}s_{19} + 4s_0s_{16}s_{18} + 8s_1s_{15}s_{18} + 4s_2s_{15}s_{17} + 4s_3s_{15}s_{16} - 4s_8s_{12}s_{14} + \\
 & 8s_9s_{10}s_{15} + 16s_9s_{12}s_{13} + 16s_{10}s_{11}s_{13} - 4s_0s_{15}s_{20} + 4s_0s_{17}s_{18} - 4s_1s_{15}s_{19} + 4s_1s_{16}s_{18} - 4s_3s_{15}s_{17} + 8s_4s_{15}s_{16} + \\
 & 16s_{10}s_{11}s_{14} + 16s_{10}s_{12}s_{13} + 4s_0s_{16}s_{20} + 4s_0s_{17}s_{19} + 8s_1s_{16}s_{19} + 4s_2s_{15}s_{19} + 4s_2s_{16}s_{18} + 4s_3s_{16}s_{17} + 8s_9s_{11}s_{16} + \\
 & 16s_9s_{13}s_{14} + 8s_{10}s_{11}s_{15} + 16s_{10}s_{12}s_{14} + 4s_0s_{18}s_{19} - 4s_1s_{16}s_{20} + 4s_1s_{17}s_{19} + 4s_3s_{15}s_{19} - 4s_3s_{16}s_{18} + 8s_4s_{16}s_{17} + \\
 & 4s_5s_{15}s_{17} + 16s_{11}s_{12}s_{14} + 4s_0s_{18}s_{20} + 8s_1s_{17}s_{20} + 4s_2s_{16}s_{20} + 4s_2s_{17}s_{19} + 4s_3s_{15}s_{20} + 4s_3s_{17}s_{18} + 8s_9s_{12}s_{17} + \\
 & 8s_{10}s_{12}s_{16} + 8s_{11}s_{12}s_{15} + 4s_0s_{19}s_{20} + 4s_1s_{18}s_{20} + 4s_3s_{16}s_{20} - 4s_3s_{17}s_{19} + 8s_4s_{17}s_{18} + 4s_5s_{16}s_{18} + 4s_6s_{15}s_{18} + \\
 & 16s_{12}s_{13}s_{14} + 4s_2s_{18}s_{20} + 4s_3s_{18}s_{19} - 4s_5s_{15}s_{20} - 4s_6s_{15}s_{19} - 4s_7s_{15}s_{18} - 4s_8s_{15}s_{17} + 8s_9s_{13}s_{18} + 8s_9s_{15}s_{16} + \\
 & 8s_{10}s_{13}s_{17} + 8s_{11}s_{13}s_{16} + 8s_{12}s_{13}s_{15} - 4s_3s_{18}s_{20} + 8s_4s_{18}s_{19} + 4s_5s_{17}s_{19} + 4s_6s_{16}s_{19} + 4s_7s_{15}s_{19} + 4s_3s_{19}s_{20} - \\
 & 4s_6s_{16}s_{20} - 4s_7s_{16}s_{19} - 4s_8s_{16}s_{18} + 8s_9s_{14}s_{19} + 8s_9s_{16}s_{17} + 8s_{10}s_{14}s_{18} + 8s_{10}s_{15}s_{17} + 8s_{11}s_{14}s_{17} + 8s_{12}s_{14}s_{16} + \\
 & 8s_{13}s_{14}s_{15} + 8s_4s_{19}s_{20} + 4s_5s_{18}s_{20} + 4s_6s_{17}s_{20} + 4s_7s_{16}s_{20} + 4s_8s_{15}s_{20} - 4s_7s_{17}s_{20} - 4s_8s_{17}s_{19} + 8s_9s_{17}s_{18} + \\
 & 8s_{10}s_{16}s_{18} + 8s_{11}s_{15}s_{18} + 8s_{10}s_{15}s_{20} + 8s_{11}s_{15}s_{19} + 8s_{12}s_{15}s_{18} + 8s_{13}s_{15}s_{17} + 8s_{14}s_{15}s_{16} - 4s_8s_{18}s_{20} + 8s_9s_{18}s_{19} + \\
 & 8s_{10}s_{17}s_{19} + 8s_{11}s_{16}s_{19} + 8s_{12}s_{15}s_{19} + 8s_{11}s_{16}s_{20} + 8s_{12}s_{16}s_{19} + 8s_{13}s_{16}s_{18} + 8s_{14}s_{16}s_{17} + 8s_9s_{19}s_{20} + 8s_{10}s_{18}s_{20} + \\
 & 8s_{11}s_{17}s_{20} + 8s_{12}s_{16}s_{20} + 8s_{13}s_{15}s_{20} + 16s_{15}s_{16}s_{17} + 8s_{12}s_{17}s_{20} + 8s_{13}s_{17}s_{19} + 8s_{14}s_{17}s_{18} + 16s_{15}s_{17}s_{18} + 8s_{13}s_{18}s_{20} + \\
 & 8s_{14}s_{18}s_{19} + 16s_{15}s_{18}s_{19} + 16s_{16}s_{17}s_{19} + 8s_{14}s_{19}s_{20} + 16s_{15}s_{19}s_{20} + 16s_{16}s_{18}s_{20} + 4s_0s_1s_2s_3 + 2s_0s_1s_4s_5 + 2s_0s_1s_5s_6 + \\
 & 2s_0s_2s_4s_6 + 2s_1s_2s_4s_5 - 2s_0s_1s_4s_8 - 2s_0s_2s_4s_7 - 2s_0s_3s_4s_6 + 2s_0s_1s_6s_7 + 2s_0s_2s_5s_7 + 2s_0s_3s_4s_7 + 2s_1s_2s_5s_6 + \\
 & 2s_1s_3s_4s_6 + 2s_2s_3s_4s_5 - 2s_1s_2s_4s_8 - 2s_1s_3s_4s_7 + 2s_0s_1s_7s_8 + 2s_0s_2s_6s_8 + 2s_0s_3s_5s_8 + 2s_1s_2s_6s_7 + 2s_1s_3s_5s_7 + \\
 & 2s_2s_3s_5s_6 - 2s_2s_3s_4s_8 + 2s_1s_2s_7s_8 + 2s_1s_3s_6s_8 + 2s_2s_3s_6s_7 + 4s_0s_1s_9s_{10} + 2s_2s_3s_7s_8 + 4s_0s_1s_{10}s_{11} + 4s_0s_2s_9s_{11} + \\
 & 4s_1s_2s_9s_{10} + 4s_4s_5s_6s_7 - 4s_4s_5s_6s_8 + 4s_0s_1s_{11}s_{12} + 4s_0s_2s_{10}s_{12} + 4s_0s_3s_9s_{12} + 4s_1s_2s_{10}s_{11} + 4s_1s_3s_9s_{11} + 4s_2s_3s_9s_{10} + \\
 & 4s_4s_5s_7s_8 - 4s_4s_6s_7s_8 + 4s_0s_1s_{12}s_{13} + 4s_0s_2s_{11}s_{13} + 4s_0s_3s_{10}s_{13} + 4s_1s_2s_{11}s_{12} + 4s_1s_3s_{10}s_{12} + 4s_2s_3s_{10}s_{11} + \\
 & 4s_5s_6s_7s_8 + 4s_0s_1s_{13}s_{14} + 4s_0s_2s_{12}s_{14} + 4s_0s_3s_{11}s_{14} + 4s_1s_2s_{12}s_{13} + 4s_1s_3s_{11}s_{13} + 4s_2s_3s_{11}s_{12} + 4s_4s_5s_9s_{10} +
 \end{aligned}$$

$$\begin{aligned}
& 4s_1s_2s_{13}s_{14} + 4s_1s_3s_{12}s_{14} + 4s_2s_3s_{12}s_{13} + 4s_4s_5s_{10}s_{11} + 4s_4s_6s_9s_{11} + 4s_5s_6s_9s_{10} - 4s_4s_5s_9s_{13} - 4s_4s_6s_9s_{12} - \\
& 4s_4s_7s_9s_{11} - 4s_4s_8s_9s_{10} + 4s_0s_1s_{15}s_{16} + 4s_2s_3s_{13}s_{14} + 4s_4s_5s_{11}s_{12} + 4s_4s_6s_{10}s_{12} + 4s_4s_7s_9s_{12} + 4s_5s_6s_{10}s_{11} + \\
& 4s_5s_7s_9s_{11} + 4s_6s_7s_9s_{10} - 4s_4s_5s_{10}s_{14} - 4s_4s_6s_{10}s_{13} - 4s_4s_7s_{10}s_{12} - 4s_4s_8s_{10}s_{11} + 4s_0s_1s_{16}s_{17} + 4s_0s_2s_{15}s_{17} + \\
& 4s_1s_2s_{15}s_{16} + 4s_4s_5s_{12}s_{13} + 4s_4s_6s_{11}s_{13} + 4s_4s_7s_{10}s_{13} + 4s_4s_8s_9s_{13} + 4s_5s_6s_{11}s_{12} + 4s_5s_7s_{10}s_{12} + 4s_5s_8s_9s_{12} + \\
& 4s_6s_7s_{10}s_{11} + 4s_6s_8s_9s_{11} + 4s_7s_8s_9s_{10} - 4s_4s_6s_{11}s_{14} - 4s_4s_7s_{11}s_{13} - 4s_4s_8s_{11}s_{12} + 4s_0s_1s_{17}s_{18} + 4s_0s_2s_{16}s_{18} + \\
& 4s_0s_3s_{15}s_{18} + 4s_1s_2s_{16}s_{17} + 4s_1s_3s_{15}s_{17} + 4s_2s_3s_{15}s_{16} + 4s_4s_5s_{13}s_{14} + 4s_4s_6s_{12}s_{14} + 4s_4s_7s_{11}s_{14} + 4s_4s_8s_{10}s_{14} + \\
& 4s_5s_6s_{12}s_{13} + 4s_5s_7s_{11}s_{13} + 4s_5s_8s_{10}s_{13} + 4s_6s_7s_{11}s_{12} + 4s_6s_8s_{10}s_{12} + 4s_7s_8s_{10}s_{11} - 4s_4s_7s_{12}s_{14} - 4s_4s_8s_{12}s_{13} + \\
& 4s_0s_1s_{18}s_{19} + 4s_0s_2s_{17}s_{19} + 4s_0s_3s_{16}s_{19} + 4s_1s_2s_{17}s_{18} + 4s_1s_3s_{16}s_{18} + 4s_2s_3s_{16}s_{17} + 4s_5s_6s_{13}s_{14} + 4s_5s_7s_{12}s_{14} + \\
& 4s_5s_8s_{11}s_{14} + 4s_6s_7s_{12}s_{13} + 4s_6s_8s_{11}s_{13} + 4s_7s_8s_{11}s_{12} - 4s_4s_8s_{13}s_{14} + 4s_0s_1s_{19}s_{20} + 4s_0s_2s_{18}s_{20} + 4s_0s_3s_{17}s_{20} + \\
& 4s_1s_2s_{18}s_{19} + 4s_1s_3s_{17}s_{19} + 4s_2s_3s_{17}s_{18} + 4s_4s_5s_{15}s_{16} + 4s_6s_7s_{13}s_{14} + 4s_6s_8s_{12}s_{14} + 4s_7s_8s_{12}s_{13} + 4s_1s_2s_{19}s_{20} + \\
& 4s_1s_3s_{18}s_{20} + 4s_2s_3s_{18}s_{19} + 4s_4s_5s_{16}s_{17} + 4s_4s_6s_{15}s_{17} + 4s_5s_6s_{15}s_{16} + 4s_7s_8s_{13}s_{14} + 16s_9s_{10}s_{11}s_{12} - 4s_4s_5s_{15}s_{19} - \\
& 4s_4s_6s_{15}s_{18} - 4s_4s_7s_{15}s_{17} - 4s_4s_8s_{15}s_{16} + 4s_2s_3s_{19}s_{20} + 4s_4s_5s_{17}s_{18} + 4s_4s_6s_{16}s_{18} + 4s_4s_7s_{15}s_{18} + 4s_5s_6s_{16}s_{17} + \\
& 4s_5s_7s_{15}s_{17} + 4s_6s_7s_{15}s_{16} + 16s_9s_{10}s_{12}s_{13} - 4s_4s_5s_{16}s_{20} - 4s_4s_6s_{16}s_{19} - 4s_4s_7s_{16}s_{18} - 4s_4s_8s_{16}s_{17} + 4s_4s_5s_{18}s_{19} + \\
& 4s_4s_6s_{17}s_{19} + 4s_4s_7s_{16}s_{19} + 4s_4s_8s_{15}s_{19} + 4s_5s_6s_{17}s_{18} + 4s_5s_7s_{16}s_{18} + 4s_5s_8s_{15}s_{18} + 4s_6s_7s_{16}s_{17} + 4s_6s_8s_{15}s_{17} + \\
& 4s_7s_8s_{15}s_{16} + 16s_9s_{10}s_{13}s_{14} + 16s_9s_{11}s_{12}s_{14} + 16s_{10}s_{11}s_{12}s_{13} - 4s_4s_6s_{17}s_{20} - 4s_4s_7s_{17}s_{19} - 4s_4s_8s_{17}s_{18} + \\
& 4s_4s_5s_{19}s_{20} + 4s_4s_6s_{18}s_{20} + 4s_4s_7s_{17}s_{20} + 4s_4s_8s_{16}s_{20} + 4s_5s_6s_{18}s_{19} + 4s_5s_7s_{17}s_{19} + 4s_5s_8s_{16}s_{19} + 4s_6s_7s_{17}s_{18} + \\
& 4s_6s_8s_{16}s_{18} + 4s_7s_8s_{16}s_{17} + 16s_{10}s_{11}s_{13}s_{14} - 4s_4s_7s_{18}s_{20} - 4s_4s_8s_{18}s_{19} + 4s_5s_6s_{19}s_{20} + 4s_5s_7s_{18}s_{20} + 4s_5s_8s_{17}s_{20} + \\
& 4s_6s_7s_{18}s_{19} + 4s_6s_8s_{17}s_{19} + 4s_7s_8s_{17}s_{18} + 8s_9s_{10}s_{15}s_{16} + 16s_{11}s_{12}s_{13}s_{14} - 4s_4s_8s_{19}s_{20} + 4s_6s_7s_{19}s_{20} + 4s_6s_8s_{18}s_{20} + \\
& 4s_7s_8s_{18}s_{19} + 8s_9s_{10}s_{16}s_{17} + 8s_9s_{11}s_{15}s_{17} + 8s_{10}s_{11}s_{15}s_{16} + 4s_7s_8s_{19}s_{20} + 8s_9s_{10}s_{17}s_{18} + 8s_9s_{11}s_{16}s_{18} + 8s_9s_{12}s_{15}s_{18} + \\
& 8s_{10}s_{11}s_{16}s_{17} + 8s_{10}s_{12}s_{15}s_{17} + 8s_{11}s_{12}s_{15}s_{16} + 8s_9s_{10}s_{18}s_{19} + 8s_9s_{11}s_{17}s_{19} + 8s_9s_{12}s_{16}s_{19} + 8s_9s_{13}s_{15}s_{19} + \\
& 8s_{10}s_{11}s_{17}s_{18} + 8s_{10}s_{12}s_{16}s_{18} + 8s_{10}s_{13}s_{15}s_{18} + 8s_{11}s_{12}s_{16}s_{17} + 8s_{11}s_{13}s_{15}s_{17} + 8s_{12}s_{13}s_{15}s_{16} + 8s_9s_{10}s_{19}s_{20} + \\
& 8s_9s_{11}s_{18}s_{20} + 8s_9s_{12}s_{17}s_{20} + 8s_9s_{13}s_{16}s_{20} + 8s_9s_{14}s_{15}s_{20} + 8s_{10}s_{11}s_{18}s_{19} + 8s_{10}s_{12}s_{17}s_{19} + 8s_{10}s_{13}s_{16}s_{19} + \\
& 8s_{10}s_{14}s_{15}s_{19} + 8s_{11}s_{12}s_{17}s_{18} + 8s_{11}s_{13}s_{16}s_{18} + 8s_{11}s_{14}s_{15}s_{18} + 8s_{12}s_{13}s_{16}s_{17} + 8s_{12}s_{14}s_{15}s_{17} + 8s_{13}s_{14}s_{15}s_{16} + \\
& 8s_{10}s_{11}s_{19}s_{20} + 8s_{10}s_{12}s_{18}s_{20} + 8s_{10}s_{13}s_{17}s_{20} + 8s_{10}s_{14}s_{16}s_{20} + 8s_{11}s_{12}s_{18}s_{19} + 8s_{11}s_{13}s_{17}s_{19} + 8s_{11}s_{14}s_{16}s_{19} + \\
& 8s_{12}s_{13}s_{17}s_{18} + 8s_{12}s_{14}s_{16}s_{18} + 8s_{13}s_{14}s_{16}s_{17} + 8s_{11}s_{12}s_{19}s_{20} + 8s_{11}s_{13}s_{18}s_{20} + 8s_{11}s_{14}s_{17}s_{20} + 8s_{12}s_{13}s_{18}s_{19} + \\
& 8s_{12}s_{14}s_{17}s_{19} + 8s_{13}s_{14}s_{17}s_{18} + 8s_{12}s_{13}s_{19}s_{20} + 8s_{12}s_{14}s_{18}s_{20} + 8s_{13}s_{14}s_{18}s_{19} + 8s_{13}s_{14}s_{19}s_{20} + 16s_{15}s_{16}s_{17}s_{18} + \\
& 16s_{15}s_{16}s_{18}s_{19} + 16s_{15}s_{16}s_{19}s_{20} + 16s_{15}s_{17}s_{18}s_{20} + 16s_{16}s_{17}s_{18}s_{19} + 16s_{16}s_{17}s_{19}s_{20} + 16s_{17}s_{18}s_{19}s_{20} + 244
\end{aligned}$$

A complete expression of $E_k(q)$ in 92-order H matrix using Turyn based method

$$\begin{aligned}
E_k(q) = & 208q_0q_1 - 336q_1 - 320q_2 - 264q_3 - 144q_4 - 272q_5 - 248q_6 - 200q_7 - 96q_8 - 328q_9 - 384q_{10} - \\
& 408q_{11} - 408q_{12} - 384q_{13} - 328q_{14} - 328q_{15} - 368q_{16} - 376q_{17} - 368q_{18} - 328q_{19} - 248q_{20} - 344q_0 + 160q_0q_2 + \\
& 128q_0q_3 + 192q_1q_2 + 32q_0q_4 + 160q_1q_3 + 72q_0q_5 + 32q_1q_4 + 176q_2q_3 + 56q_0q_6 + 88q_1q_5 + 32q_2q_4 + 40q_0q_7 + \\
& 72q_1q_6 + 56q_2q_5 + 32q_3q_4 + 8q_0q_8 + 24q_1q_7 + 56q_2q_6 + 24q_3q_5 + 56q_0q_9 + 8q_1q_8 + 40q_2q_7 + 24q_3q_6 + 96q_4q_5 + \\
& 72q_0q_{10} + 56q_1q_9 + 8q_2q_8 + 40q_3q_7 + 64q_4q_6 + 88q_0q_{11} + 72q_1q_{10} + 56q_2q_9 + 24q_3q_8 + 32q_4q_7 + 208q_5q_6 + \\
& 88q_0q_{12} + 88q_1q_{11} + 72q_2q_{10} + 56q_3q_9 - 64q_4q_8 + 144q_5q_7 + 72q_0q_{13} + 88q_1q_{12} + 72q_2q_{11} + 56q_3q_{10} + 16q_4q_9 + \\
& 80q_5q_8 + 160q_6q_7 + 56q_0q_{14} + 72q_1q_{13} + 72q_2q_{12} + 56q_3q_{11} + 32q_4q_{10} + 40q_5q_9 + 112q_6q_8 + 56q_0q_{15} + 56q_1q_{14} + \\
& 72q_2q_{13} + 56q_3q_{12} + 32q_4q_{11} + 56q_5q_{10} + 40q_6q_9 + 176q_7q_8 + 80q_0q_{16} + 56q_1q_{15} + 56q_2q_{14} + 56q_3q_{13} + \\
& 32q_4q_{12} + 72q_5q_{11} + 56q_6q_{10} + 40q_7q_9 + 80q_0q_{17} + 72q_1q_{16} + 56q_2q_{15} + 56q_3q_{14} + 32q_4q_{13} + 72q_5q_{12} + \\
& 56q_6q_{11} + 40q_7q_{10} + 24q_8q_9 + 80q_0q_{18} + 96q_1q_{17} + 72q_2q_{16} + 56q_3q_{15} + 16q_4q_{14} + 56q_5q_{13} + 56q_6q_{12} + \\
& 40q_7q_{11} + 24q_8q_{10} + 56q_0q_{19} + 72q_1q_{18} + 64q_2q_{17} + 48q_3q_{16} + 32q_4q_{15} + 40q_5q_{14} + 56q_6q_{13} + 40q_7q_{12} + \\
& 24q_8q_{11} + 208q_9q_{10} + 40q_0q_{20} + 56q_1q_{19} + 72q_2q_{18} + 48q_3q_{17} + 32q_4q_{16} + 40q_5q_{15} + 40q_6q_{14} + 40q_7q_{13} + \\
& 24q_8q_{12} + 176q_9q_{11} + 40q_1q_{20} + 56q_2q_{19} + 48q_3q_{18} + 32q_4q_{17} + 64q_5q_{16} + 40q_6q_{15} + 40q_7q_{14} + 24q_8q_{13} + \\
& 144q_9q_{12} + 224q_{10}q_{11} + 40q_2q_{20} + 56q_3q_{19} + 32q_4q_{18} + 80q_5q_{17} + 56q_6q_{16} + 40q_7q_{15} + 24q_8q_{14} + 128q_9q_{13} + \\
& 176q_{10}q_{12} + 40q_3q_{20} + 32q_4q_{19} + 64q_5q_{18} + 64q_6q_{17} + 40q_7q_{16} + 24q_8q_{15} + 96q_9q_{14} + 176q_{10}q_{13} + 240q_{11}q_{12} + \\
& 40q_5q_{19} + 56q_6q_{18} + 32q_7q_{17} + 16q_8q_{16} + 64q_9q_{15} + 128q_{10}q_{14} + 176q_{11}q_{13} + 24q_5q_{20} + 40q_6q_{19} + 40q_7q_{18} + \\
& 16q_8q_{17} + 64q_9q_{16} + 72q_{10}q_{15} + 144q_{11}q_{14} + 224q_{12}q_{13} + 24q_6q_{20} + 40q_7q_{19} + 16q_8q_{18} + 64q_9q_{17} + 80q_{10}q_{16} + \\
& 72q_{11}q_{15} + 176q_{12}q_{14} + 24q_7q_{20} + 24q_8q_{19} + 64q_9q_{18} + 80q_{10}q_{17} + 88q_{11}q_{16} + 72q_{12}q_{15} + 208q_{13}q_{14} + 24q_8q_{20} + \\
& 64q_9q_{19} + 80q_{10}q_{18} + 96q_{11}q_{17} + 88q_{12}q_{16} + 72q_{13}q_{15} + 56q_9q_{20} + 72q_{10}q_{19} + 88q_{11}q_{18} + 96q_{12}q_{17} + 80q_{13}q_{16} +
\end{aligned}$$

$$\begin{aligned}
& 64q_{14}q_{15} + 56q_{10}q_{20} + 72q_{11}q_{19} + 88q_{12}q_{18} + 80q_{13}q_{17} + 64q_{14}q_{16} + 56q_{11}q_{20} + 72q_{12}q_{19} + 80q_{13}q_{18} + \\
& 64q_{14}q_{17} + 200q_{15}q_{16} + 56q_{12}q_{20} + 72q_{13}q_{19} + 64q_{14}q_{18} + 168q_{15}q_{17} + 56q_{13}q_{20} + 64q_{14}q_{19} + 152q_{15}q_{18} + \\
& 216q_{16}q_{17} + 56q_{14}q_{20} + 120q_{15}q_{19} + 168q_{16}q_{18} + 72q_{15}q_{20} + 152q_{16}q_{19} + 216q_{17}q_{18} + 104q_{16}q_{20} + 168q_{17}q_{19} + \\
& 120q_{17}q_{20} + 200q_{18}q_{19} + 152q_{18}q_{20} + 200q_{19}q_{20} - 64q_0q_1q_2 - 96q_0q_1q_3 - 32q_0q_1q_4 - 32q_0q_2q_3 - 32q_0q_1q_5 - \\
& 64q_1q_2q_3 - 32q_0q_1q_6 - 32q_0q_2q_5 - 32q_1q_2q_4 - 32q_0q_1q_7 - 32q_0q_2q_6 - 16q_0q_3q_5 - 32q_1q_2q_5 - 16q_0q_4q_5 - \\
& 32q_1q_2q_6 - 32q_1q_3q_5 - 32q_2q_3q_4 - 32q_0q_1q_9 - 16q_0q_4q_6 - 32q_1q_2q_7 - 32q_1q_3q_6 - 48q_1q_4q_5 - 32q_2q_3q_5 - \\
& 32q_0q_1q_{10} - 16q_0q_2q_9 - 16q_0q_3q_8 + 16q_0q_4q_7 - 32q_0q_5q_6 - 32q_2q_3q_6 - 16q_2q_4q_5 - 32q_0q_1q_{11} - 32q_0q_2q_{10} - \\
& 16q_0q_3q_9 + 16q_0q_4q_8 - 32q_0q_5q_7 - 32q_1q_2q_9 - 32q_1q_5q_6 - 32q_2q_3q_7 - 32q_2q_4q_6 - 16q_3q_4q_5 - 32q_0q_1q_{12} - \\
& 32q_0q_2q_{11} - 16q_0q_3q_{10} - 16q_0q_5q_8 - 32q_0q_6q_7 - 32q_1q_2q_{10} - 16q_1q_3q_9 + 48q_1q_4q_8 - 32q_1q_5q_7 + 32q_2q_4q_7 - \\
& 32q_2q_5q_6 + 16q_3q_4q_6 - 32q_0q_1q_{13} - 32q_0q_2q_{12} - 32q_0q_3q_{11} - 32q_0q_6q_8 - 32q_1q_2q_{11} - 32q_1q_3q_{10} - 32q_1q_5q_8 - \\
& 32q_1q_6q_7 - 32q_2q_3q_9 + 16q_2q_4q_8 - 32q_2q_5q_7 - 16q_3q_4q_7 - 32q_3q_5q_6 - 32q_0q_1q_{14} - 32q_0q_2q_{13} - 32q_0q_3q_{12} - \\
& 32q_0q_7q_8 - 32q_1q_2q_{12} - 32q_1q_3q_{11} - 32q_1q_6q_8 - 32q_2q_3q_{10} - 32q_2q_6q_7 + 16q_3q_4q_8 - 64q_4q_5q_6 - 32q_0q_1q_{15} - \\
& 16q_0q_2q_{14} - 16q_0q_3q_{13} - 32q_1q_2q_{13} - 32q_1q_3q_{12} - 32q_1q_7q_8 - 32q_2q_3q_{11} - 32q_2q_6q_8 - 16q_3q_5q_8 - 32q_3q_6q_7 - \\
& 32q_4q_5q_7 - 32q_0q_1q_{16} - 16q_0q_2q_{15} - 16q_0q_3q_{14} - 32q_1q_2q_{14} - 32q_1q_3q_{13} - 32q_2q_3q_{12} - 32q_2q_7q_8 - \\
& 64q_4q_6q_7 - 32q_0q_1q_{17} - 32q_0q_2q_{16} - 16q_0q_3q_{15} - 32q_1q_2q_{15} - 16q_1q_3q_{14} - 32q_2q_3q_{13} - 32q_3q_7q_8 - \\
& 16q_4q_5q_9 + 96q_4q_6q_8 - 64q_5q_6q_7 - 32q_0q_1q_{18} - 32q_0q_2q_{17} - 16q_0q_3q_{16} - 32q_0q_9q_{10} - 32q_1q_2q_{16} - \\
& 16q_1q_3q_{15} - 32q_2q_3q_{14} - 16q_4q_5q_{10} - 64q_4q_7q_8 - 32q_5q_6q_8 - 32q_0q_1q_{19} - 32q_0q_2q_{18} - 32q_0q_3q_{17} - \\
& 32q_0q_9q_{11} - 32q_1q_2q_{17} - 32q_1q_3q_{16} - 32q_1q_9q_{10} - 32q_2q_3q_{15} - 16q_4q_5q_{11} - 16q_4q_6q_{10} - 32q_5q_6q_9 - \\
& 32q_5q_7q_8 - 16q_0q_1q_{20} - 16q_0q_2q_{19} - 16q_0q_3q_{18} - 16q_0q_9q_{12} - 32q_0q_{10}q_{11} - 32q_1q_2q_{18} - 32q_1q_3q_{17} - \\
& 32q_1q_9q_{11} - 32q_2q_3q_{16} - 32q_2q_9q_{10} - 16q_4q_5q_{12} + 16q_4q_7q_{10} + 16q_4q_8q_9 - 32q_5q_6q_{10} - 16q_5q_7q_9 - \\
& 16q_0q_2q_{20} - 16q_0q_3q_{19} - 16q_0q_9q_{13} - 32q_0q_{10}q_{12} - 32q_1q_2q_{19} - 32q_1q_3q_{18} - 32q_1q_9q_{12} - 32q_1q_{10}q_{11} - \\
& 32q_2q_3q_{17} - 32q_2q_9q_{11} - 32q_3q_9q_{10} - 16q_4q_5q_{13} + 16q_4q_8q_{10} - 32q_5q_6q_{11} - 32q_5q_7q_{10} - 16q_5q_8q_9 - \\
& 32q_6q_7q_9 - 16q_0q_3q_{20} + 16q_0q_9q_{14} - 16q_0q_{10}q_{13} - 32q_0q_{11}q_{12} - 16q_1q_2q_{20} - 16q_1q_3q_{19} + 16q_1q_9q_{13} - \\
& 32q_1q_{10}q_{12} - 32q_2q_3q_{18} - 32q_2q_{10}q_{11} - 16q_4q_5q_{14} - 16q_4q_6q_{13} + 16q_4q_8q_{11} - 32q_4q_9q_{10} - 32q_5q_6q_{12} - \\
& 32q_5q_7q_{11} - 16q_5q_8q_{10} - 32q_6q_7q_{10} - 16q_6q_8q_9 - 16q_0q_{10}q_{14} - 32q_0q_{11}q_{13} - 16q_1q_3q_{20} - 32q_1q_{10}q_{13} - \\
& 32q_1q_{11}q_{12} - 32q_2q_3q_{19} - 16q_2q_9q_{13} - 32q_2q_{10}q_{12} - 16q_3q_9q_{12} - 32q_3q_{10}q_{11} - 16q_4q_5q_{15} + 16q_4q_7q_{13} + \\
& 16q_4q_8q_{12} - 32q_5q_6q_{13} - 32q_5q_7q_{12} - 32q_5q_8q_{11} - 32q_5q_9q_{10} - 32q_6q_7q_{11} - 32q_6q_8q_{10} - 32q_7q_8q_9 - \\
& 16q_0q_{11}q_{14} - 32q_0q_{12}q_{13} + 16q_1q_{10}q_{14} - 32q_1q_{11}q_{13} - 16q_2q_3q_{20} - 32q_2q_{11}q_{12} - 16q_3q_9q_{13} - 16q_4q_5q_{16} + \\
& 16q_4q_8q_{13} - 32q_4q_{10}q_{11} - 32q_5q_6q_{14} - 32q_5q_7q_{13} - 32q_5q_8q_{12} - 32q_5q_9q_{11} - 32q_6q_7q_{12} - 32q_6q_8q_{11} - \\
& 32q_6q_9q_{10} - 32q_7q_8q_{10} - 32q_0q_{12}q_{14} - 32q_1q_{11}q_{14} - 32q_1q_{12}q_{13} - 16q_2q_{10}q_{14} - 32q_2q_{11}q_{13} - 16q_3q_9q_{14} - \\
& 16q_3q_{10}q_{13} - 32q_3q_{11}q_{12} - 32q_4q_5q_{17} - 16q_4q_6q_{16} + 16q_4q_8q_{14} - 32q_5q_6q_{15} - 16q_5q_7q_{14} - 16q_5q_8q_{13} - \\
& 16q_5q_9q_{12} - 32q_5q_{10}q_{11} - 32q_6q_7q_{13} - 32q_6q_8q_{12} - 32q_6q_9q_{11} - 32q_7q_8q_{11} - 32q_7q_9q_{10} - 32q_0q_{13}q_{14} - \\
& 32q_1q_{12}q_{14} - 32q_2q_{12}q_{13} - 16q_3q_{10}q_{14} - 16q_4q_5q_{18} + 16q_4q_7q_{16} + 16q_4q_8q_{15} - 32q_4q_{11}q_{12} - 32q_5q_6q_{16} - \\
& 16q_5q_7q_{15} - 16q_5q_8q_{14} + 16q_5q_9q_{13} - 32q_5q_{10}q_{12} - 32q_6q_7q_{14} - 32q_6q_8q_{13} - 32q_6q_{10}q_{11} - 32q_7q_8q_{12} - \\
& 32q_1q_{13}q_{14} - 32q_2q_{12}q_{14} - 16q_3q_{11}q_{14} - 32q_3q_{12}q_{13} - 16q_4q_5q_{19} - 16q_4q_6q_{18} + 16q_4q_8q_{16} - 32q_5q_6q_{17} - \\
& 32q_5q_7q_{16} - 16q_5q_8q_{15} + 16q_5q_9q_{14} - 16q_5q_{10}q_{13} - 32q_5q_{11}q_{12} - 32q_6q_7q_{15} - 16q_6q_8q_{14} + 16q_6q_9q_{13} - \\
& 32q_6q_{10}q_{12} - 32q_7q_8q_{13} - 32q_7q_{10}q_{11} - 32q_2q_{13}q_{14} + 16q_4q_7q_{18} + 32q_4q_8q_{17} - 32q_4q_{12}q_{13} - 32q_5q_6q_{18} - \\
& 32q_5q_7q_{17} - 16q_5q_8q_{16} + 16q_5q_{10}q_{14} - 32q_5q_{11}q_{13} - 32q_6q_7q_{16} - 16q_6q_8q_{15} - 32q_6q_{11}q_{12} - 32q_7q_8q_{14} - \\
& 16q_7q_9q_{13} - 16q_8q_9q_{12} - 32q_3q_{13}q_{14} + 16q_4q_8q_{18} - 32q_5q_6q_{19} - 32q_5q_7q_{18} - 32q_5q_8q_{17} - 16q_5q_{11}q_{14} - \\
& 32q_5q_{12}q_{13} - 32q_6q_7q_{17} - 32q_6q_8q_{16} + 16q_6q_{10}q_{14} - 32q_6q_{11}q_{13} - 32q_7q_8q_{15} - 32q_7q_{11}q_{12} - 16q_8q_9q_{13} - \\
& 64q_9q_{10}q_{11} - 32q_0q_{15}q_{16} + 16q_4q_8q_{19} - 32q_4q_{13}q_{14} - 16q_5q_6q_{20} - 16q_5q_7q_{19} - 16q_5q_8q_{18} - 32q_5q_{12}q_{14} - \\
& 32q_6q_7q_{18} - 32q_6q_8q_{17} - 32q_6q_{12}q_{13} - 32q_7q_8q_{16} - 16q_7q_{10}q_{14} - 16q_8q_9q_{14} - 16q_8q_{10}q_{13} - 64q_9q_{10}q_{12} - \\
& 32q_0q_{15}q_{17} - 32q_1q_{15}q_{16} - 16q_5q_7q_{20} - 16q_5q_8q_{19} - 32q_5q_{13}q_{14} - 32q_6q_7q_{19} - 32q_6q_8q_{18} - 32q_6q_{12}q_{14} - \\
& 32q_7q_8q_{17} - 32q_7q_{12}q_{13} - 16q_8q_{10}q_{14} - 64q_9q_{10}q_{13} - 96q_9q_{11}q_{12} - 16q_0q_{15}q_{18} - 32q_0q_{16}q_{17} - 32q_1q_{15}q_{17} - \\
& 32q_2q_{15}q_{16} - 16q_5q_8q_{20} - 16q_6q_7q_{20} - 16q_6q_8q_{19} - 32q_6q_{13}q_{14} - 32q_7q_8q_{18} - 16q_8q_{11}q_{14} - 64q_9q_{10}q_{14} - \\
& 32q_9q_{11}q_{13} - 64q_{10}q_{11}q_{12} - 16q_0q_{15}q_{19} - 32q_0q_{16}q_{18} - 32q_1q_{15}q_{18} - 32q_1q_{16}q_{17} - 32q_2q_{15}q_{17} - 32q_3q_{15}q_{16} - \\
& 16q_6q_8q_{20} - 32q_7q_8q_{19} - 32q_7q_{13}q_{14} - 32q_9q_{10}q_{15} - 32q_9q_{11}q_{14} - 64q_9q_{12}q_{13} - 96q_{10}q_{11}q_{13} + 16q_0q_{15}q_{20} - \\
& 16q_0q_{16}q_{19} - 32q_0q_{17}q_{18} + 16q_1q_{15}q_{19} - 32q_1q_{16}q_{18} - 32q_2q_{16}q_{17} - 32q_4q_{15}q_{16} - 16q_7q_8q_{20} - 32q_9q_{10}q_{16} -
\end{aligned}$$

$$\begin{aligned}
& 16q_9q_{11}q_{15} - 32q_9q_{12}q_{14} - 64q_{10}q_{11}q_{14} - 96q_{10}q_{12}q_{13} - 16q_0q_{16}q_{20} - 32q_0q_{17}q_{19} - 32q_1q_{16}q_{19} - 32q_1q_{17}q_{18} - \\
& 16q_2q_{15}q_{19} - 32q_2q_{16}q_{18} - 16q_3q_{15}q_{18} - 32q_3q_{16}q_{17} - 32q_5q_{15}q_{16} - 32q_9q_{10}q_{17} - 32q_9q_{11}q_{16} - 16q_9q_{12}q_{15} - \\
& 64q_9q_{13}q_{14} - 32q_{10}q_{11}q_{15} - 32q_{10}q_{12}q_{14} - 64q_{11}q_{12}q_{13} - 16q_0q_{17}q_{20} - 32q_0q_{18}q_{19} + 16q_1q_{16}q_{20} - \\
& 32q_1q_{17}q_{19} - 32q_2q_{17}q_{18} - 16q_3q_{15}q_{19} - 32q_4q_{16}q_{17} - 32q_5q_{15}q_{17} - 32q_6q_{15}q_{16} - 32q_9q_{10}q_{18} - 32q_9q_{11}q_{17} - \\
& 16q_9q_{12}q_{16} - 16q_9q_{13}q_{15} - 32q_{10}q_{11}q_{16} - 16q_{10}q_{12}q_{15} - 64q_{10}q_{13}q_{14} - 96q_{11}q_{12}q_{14} - 32q_0q_{18}q_{20} - \\
& 32q_1q_{17}q_{20} - 32q_1q_{18}q_{19} - 16q_2q_{16}q_{20} - 32q_2q_{17}q_{19} - 16q_3q_{15}q_{20} - 16q_3q_{16}q_{19} - 32q_3q_{17}q_{18} - 16q_5q_{15}q_{18} - \\
& 32q_5q_{16}q_{17} - 32q_6q_{15}q_{17} - 32q_7q_{15}q_{16} - 32q_9q_{10}q_{19} - 32q_9q_{11}q_{18} - 32q_9q_{12}q_{17} - 16q_9q_{13}q_{16} - 16q_9q_{14}q_{15} - \\
& 32q_{10}q_{11}q_{17} - 32q_{10}q_{12}q_{16} - 16q_{10}q_{13}q_{15} - 32q_{11}q_{12}q_{15} - 64q_{11}q_{13}q_{14} - 32q_0q_{19}q_{20} - 32q_1q_{18}q_{20} - \\
& 32q_2q_{18}q_{19} - 16q_3q_{16}q_{20} - 32q_4q_{17}q_{18} + 16q_5q_{15}q_{19} - 32q_5q_{16}q_{18} - 32q_6q_{16}q_{17} - 16q_9q_{10}q_{20} - 16q_9q_{11}q_{19} - \\
& 16q_9q_{12}q_{18} - 32q_{10}q_{11}q_{18} - 32q_{10}q_{12}q_{17} - 16q_{10}q_{13}q_{16} - 16q_{10}q_{14}q_{15} - 32q_{11}q_{12}q_{16} - 16q_{11}q_{13}q_{15} - \\
& 64q_{12}q_{13}q_{14} - 32q_1q_{19}q_{20} - 32q_2q_{18}q_{20} - 16q_3q_{17}q_{20} - 32q_3q_{18}q_{19} + 16q_5q_{15}q_{20} - 16q_5q_{16}q_{19} - 32q_5q_{17}q_{18} + \\
& 16q_6q_{15}q_{19} - 32q_6q_{16}q_{18} - 32q_7q_{16}q_{17} - 16q_9q_{11}q_{20} - 16q_9q_{12}q_{19} - 16q_9q_{13}q_{18} - 32q_9q_{15}q_{16} - 32q_{10}q_{11}q_{19} - \\
& 32q_{10}q_{12}q_{18} - 32q_{10}q_{13}q_{17} - 16q_{10}q_{14}q_{16} - 32q_{11}q_{12}q_{17} - 32q_{11}q_{13}q_{16} - 16q_{11}q_{14}q_{15} - 32q_{12}q_{13}q_{15} - \\
& 32q_2q_{19}q_{20} - 32q_4q_{18}q_{19} + 16q_5q_{16}q_{20} - 32q_5q_{17}q_{19} - 32q_6q_{17}q_{18} - 16q_7q_{15}q_{19} - 16q_8q_{15}q_{18} - 16q_9q_{12}q_{20} - \\
& 16q_9q_{13}q_{19} - 16q_9q_{15}q_{17} - 16q_{10}q_{11}q_{20} - 16q_{10}q_{12}q_{19} - 16q_{10}q_{13}q_{18} - 32q_{10}q_{15}q_{16} - 32q_{11}q_{12}q_{18} - \\
& 32q_{11}q_{13}q_{17} - 16q_{11}q_{14}q_{16} - 32q_{12}q_{13}q_{16} - 16q_{12}q_{14}q_{15} - 32q_3q_{19}q_{20} - 16q_5q_{17}q_{20} - 32q_5q_{18}q_{19} + \\
& 16q_6q_{16}q_{20} - 32q_6q_{17}q_{19} - 32q_7q_{17}q_{18} - 16q_8q_{15}q_{19} - 16q_9q_{13}q_{20} - 16q_9q_{14}q_{19} - 16q_9q_{15}q_{18} - 32q_9q_{16}q_{17} - \\
& 16q_{10}q_{12}q_{20} - 16q_{10}q_{13}q_{19} - 16q_{10}q_{14}q_{18} - 32q_{10}q_{15}q_{17} - 32q_{11}q_{12}q_{19} - 32q_{11}q_{13}q_{18} - 32q_{11}q_{14}q_{17} - \\
& 32q_{11}q_{15}q_{16} - 32q_{12}q_{13}q_{17} - 32q_{12}q_{14}q_{16} - 32q_{13}q_{14}q_{15} - 32q_4q_{19}q_{20} - 32q_5q_{18}q_{20} - 32q_6q_{18}q_{19} - \\
& 16q_7q_{16}q_{20} - 16q_8q_{15}q_{20} - 16q_8q_{16}q_{19} - 16q_9q_{14}q_{20} - 16q_9q_{15}q_{19} - 16q_9q_{16}q_{18} - 16q_{10}q_{13}q_{20} - 16q_{10}q_{14}q_{19} - \\
& 16q_{10}q_{15}q_{18} - 32q_{10}q_{16}q_{17} - 16q_{11}q_{12}q_{20} - 16q_{11}q_{13}q_{19} - 16q_{11}q_{14}q_{18} - 32q_{11}q_{15}q_{17} - 32q_{12}q_{13}q_{18} - \\
& 32q_{12}q_{14}q_{17} - 32q_{12}q_{15}q_{16} - 32q_{13}q_{14}q_{16} - 32q_5q_{19}q_{20} - 32q_6q_{18}q_{20} - 32q_7q_{18}q_{19} - 16q_8q_{16}q_{20} - \\
& 16q_9q_{15}q_{20} - 16q_9q_{16}q_{19} - 32q_9q_{17}q_{18} - 16q_{10}q_{14}q_{20} - 16q_{10}q_{15}q_{19} - 32q_{10}q_{16}q_{18} - 16q_{11}q_{13}q_{20} - \\
& 16q_{11}q_{14}q_{19} - 32q_{11}q_{15}q_{18} - 32q_{11}q_{16}q_{17} - 32q_{12}q_{13}q_{19} - 32q_{12}q_{14}q_{18} - 32q_{12}q_{15}q_{17} - 32q_{13}q_{14}q_{17} - \\
& 32q_{13}q_{15}q_{16} - 32q_6q_{19}q_{20} - 16q_8q_{17}q_{20} - 16q_9q_{16}q_{20} - 16q_9q_{17}q_{19} - 16q_{10}q_{15}q_{20} - 16q_{10}q_{16}q_{19} - \\
& 32q_{10}q_{17}q_{18} - 16q_{11}q_{14}q_{20} - 16q_{11}q_{15}q_{19} - 32q_{11}q_{16}q_{18} - 16q_{12}q_{13}q_{20} - 16q_{12}q_{14}q_{19} - 32q_{12}q_{15}q_{18} - \\
& 32q_{12}q_{16}q_{17} - 32q_{13}q_{14}q_{18} - 32q_{13}q_{15}q_{17} - 32q_{14}q_{15}q_{16} - 32q_7q_{19}q_{20} - 16q_9q_{17}q_{20} - 32q_9q_{18}q_{19} - \\
& 16q_{10}q_{16}q_{20} - 32q_{10}q_{17}q_{19} - 32q_{11}q_{16}q_{19} - 32q_{11}q_{17}q_{18} - 16q_{12}q_{14}q_{20} - 16q_{12}q_{15}q_{19} - 32q_{12}q_{16}q_{18} - \\
& 32q_{13}q_{14}q_{19} - 16q_{13}q_{15}q_{18} - 32q_{13}q_{16}q_{17} - 16q_{14}q_{15}q_{17} - 16q_9q_{18}q_{20} - 16q_{10}q_{17}q_{20} - 32q_{10}q_{18}q_{19} - \\
& 16q_{11}q_{16}q_{20} - 32q_{11}q_{17}q_{19} - 32q_{12}q_{16}q_{19} - 32q_{12}q_{17}q_{18} - 16q_{13}q_{14}q_{20} - 16q_{13}q_{15}q_{19} - 32q_{13}q_{16}q_{18} - \\
& 16q_{14}q_{15}q_{18} - 32q_{14}q_{16}q_{17} - 32q_9q_{19}q_{20} - 32q_{10}q_{18}q_{20} - 32q_{11}q_{17}q_{20} - 32q_{11}q_{18}q_{19} - 16q_{12}q_{16}q_{20} - \\
& 32q_{12}q_{17}q_{19} - 16q_{13}q_{15}q_{20} - 16q_{13}q_{16}q_{19} - 32q_{13}q_{17}q_{18} - 16q_{14}q_{15}q_{19} - 16q_{14}q_{16}q_{18} - 64q_{15}q_{16}q_{17} - \\
& 32q_{10}q_{19}q_{20} - 32q_{11}q_{18}q_{20} - 32q_{12}q_{17}q_{20} - 32q_{12}q_{18}q_{19} - 16q_{13}q_{16}q_{20} - 32q_{13}q_{17}q_{19} - 16q_{14}q_{15}q_{20} - \\
& 16q_{14}q_{16}q_{19} - 32q_{14}q_{17}q_{18} - 64q_{15}q_{16}q_{18} - 32q_{11}q_{19}q_{20} - 32q_{12}q_{18}q_{20} - 16q_{13}q_{17}q_{20} - 32q_{13}q_{18}q_{19} - \\
& 16q_{14}q_{16}q_{20} - 16q_{14}q_{17}q_{19} - 64q_{15}q_{16}q_{19} - 96q_{15}q_{17}q_{18} - 32q_{12}q_{19}q_{20} - 32q_{13}q_{18}q_{20} - 16q_{14}q_{17}q_{20} - \\
& 32q_{14}q_{18}q_{19} - 32q_{15}q_{16}q_{20} - 64q_{16}q_{17}q_{18} - 32q_{13}q_{19}q_{20} - 16q_{14}q_{18}q_{20} - 32q_{15}q_{17}q_{20} - 64q_{15}q_{18}q_{19} - \\
& 96q_{16}q_{17}q_{19} - 32q_{14}q_{19}q_{20} - 32q_{15}q_{18}q_{20} - 32q_{16}q_{17}q_{20} - 64q_{16}q_{18}q_{19} - 64q_{15}q_{19}q_{20} - 32q_{16}q_{18}q_{20} - \\
& 64q_{17}q_{18}q_{19} - 64q_{16}q_{19}q_{20} - 64q_{17}q_{18}q_{20} - 64q_{17}q_{19}q_{20} - 32q_{18}q_{19}q_{20} + 64q_0q_1q_2q_3 + 32q_0q_1q_4q_5 + \\
& 32q_0q_1q_5q_6 + 32q_0q_2q_4q_6 + 32q_1q_2q_4q_5 - 32q_0q_1q_4q_8 - 32q_0q_2q_4q_7 - 32q_0q_3q_4q_6 + 32q_0q_1q_6q_7 + \\
& 32q_0q_2q_5q_7 + 32q_0q_3q_4q_7 + 32q_1q_2q_5q_6 + 32q_1q_3q_4q_6 + 32q_2q_3q_4q_5 - 32q_1q_2q_4q_8 - 32q_1q_3q_4q_7 + \\
& 32q_0q_1q_7q_8 + 32q_0q_2q_6q_8 + 32q_0q_3q_5q_8 + 32q_1q_2q_6q_7 + 32q_1q_3q_5q_7 + 32q_2q_3q_5q_6 - 32q_2q_3q_4q_8 + \\
& 32q_1q_2q_7q_8 + 32q_1q_3q_6q_8 + 32q_2q_3q_6q_7 + 32q_0q_1q_9q_{10} + 32q_2q_3q_7q_8 + 32q_0q_1q_{10}q_{11} + 32q_0q_2q_9q_{11} + \\
& 32q_1q_2q_9q_{10} + 64q_4q_5q_6q_7 - 64q_4q_5q_6q_8 + 32q_0q_1q_{11}q_{12} + 32q_0q_2q_{10}q_{12} + 32q_0q_3q_9q_{12} + 32q_1q_2q_{10}q_{11} + \\
& 32q_1q_3q_9q_{11} + 32q_2q_3q_9q_{10} + 64q_4q_5q_7q_8 - 64q_4q_6q_7q_8 + 32q_0q_1q_{12}q_{13} + 32q_0q_2q_{11}q_{13} + 32q_0q_3q_{10}q_{13} + \\
& 32q_1q_2q_{11}q_{12} + 32q_1q_3q_{10}q_{12} + 32q_2q_3q_{10}q_{11} + 64q_5q_6q_7q_8 + 32q_0q_1q_{13}q_{14} + 32q_0q_2q_{12}q_{14} + 32q_0q_3q_{11}q_{14} + \\
& 32q_1q_2q_{12}q_{13} + 32q_1q_3q_{11}q_{13} + 32q_2q_3q_{11}q_{12} + 32q_4q_5q_9q_{10} + 32q_1q_2q_{13}q_{14} + 32q_1q_3q_{12}q_{14} + 32q_2q_3q_{12}q_{13} + \\
& 32q_4q_5q_{10}q_{11} + 32q_4q_6q_9q_{11} + 32q_5q_6q_9q_{10} - 32q_4q_5q_9q_{13} - 32q_4q_6q_9q_{12} - 32q_4q_7q_9q_{11} - 32q_4q_8q_9q_{10} + \\
& 32q_0q_1q_{15}q_{16} + 32q_2q_3q_{13}q_{14} + 32q_4q_5q_{11}q_{12} + 32q_4q_6q_{10}q_{12} + 32q_4q_7q_9q_{12} + 32q_5q_6q_{10}q_{11} + 32q_5q_7q_9q_{11} +
\end{aligned}$$

$$\begin{aligned}
& 32q_6q_7q_9q_{10} - 32q_4q_5q_{10}q_{14} - 32q_4q_6q_{10}q_{13} - 32q_4q_7q_{10}q_{12} - 32q_4q_8q_{10}q_{11} + 32q_0q_1q_{16}q_{17} + 32q_0q_2q_{15}q_{17} + \\
& 32q_1q_2q_{15}q_{16} + 32q_4q_5q_{12}q_{13} + 32q_4q_6q_{11}q_{13} + 32q_4q_7q_{10}q_{13} + 32q_4q_8q_9q_{13} + 32q_5q_6q_{11}q_{12} + 32q_5q_7q_{10}q_{12} + \\
& 32q_5q_8q_9q_{12} + 32q_6q_7q_{10}q_{11} + 32q_6q_8q_9q_{11} + 32q_7q_8q_9q_{10} - 32q_4q_6q_{11}q_{14} - 32q_4q_7q_{11}q_{13} - 32q_4q_8q_{11}q_{12} + \\
& 32q_0q_1q_{17}q_{18} + 32q_0q_2q_{16}q_{18} + 32q_0q_3q_{15}q_{18} + 32q_1q_2q_{16}q_{17} + 32q_1q_3q_{15}q_{17} + 32q_2q_3q_{15}q_{16} + 32q_4q_5q_{13}q_{14} + \\
& 32q_4q_6q_{12}q_{14} + 32q_4q_7q_{11}q_{14} + 32q_4q_8q_{10}q_{14} + 32q_5q_6q_{12}q_{13} + 32q_5q_7q_{11}q_{13} + 32q_5q_8q_{10}q_{13} + 32q_6q_7q_{11}q_{12} + \\
& 32q_6q_8q_{10}q_{12} + 32q_7q_8q_{10}q_{11} - 32q_4q_7q_{12}q_{14} - 32q_4q_8q_{12}q_{13} + 32q_0q_1q_{18}q_{19} + 32q_0q_2q_{17}q_{19} + 32q_0q_3q_{16}q_{19} + \\
& 32q_1q_2q_{17}q_{18} + 32q_1q_3q_{16}q_{18} + 32q_2q_3q_{16}q_{17} + 32q_5q_6q_{13}q_{14} + 32q_5q_7q_{12}q_{14} + 32q_5q_8q_{11}q_{14} + 32q_6q_7q_{12}q_{13} + \\
& 32q_6q_8q_{11}q_{13} + 32q_7q_8q_{11}q_{12} - 32q_4q_8q_{13}q_{14} + 32q_0q_1q_{19}q_{20} + 32q_0q_2q_{18}q_{20} + 32q_0q_3q_{17}q_{20} + 32q_1q_2q_{18}q_{19} + \\
& 32q_1q_3q_{17}q_{19} + 32q_2q_3q_{17}q_{18} + 32q_4q_5q_{15}q_{16} + 32q_6q_7q_{13}q_{14} + 32q_6q_8q_{12}q_{14} + 32q_7q_8q_{12}q_{13} + 32q_1q_2q_{19}q_{20} + \\
& 32q_1q_3q_{18}q_{20} + 32q_2q_3q_{18}q_{19} + 32q_4q_5q_{16}q_{17} + 32q_4q_6q_{15}q_{17} + 32q_5q_6q_{15}q_{16} + 32q_7q_8q_{13}q_{14} + 64q_9q_{10}q_{11}q_{12} - \\
& 32q_4q_5q_{15}q_{19} - 32q_4q_6q_{15}q_{18} - 32q_4q_7q_{15}q_{17} - 32q_4q_8q_{15}q_{16} + 32q_2q_3q_{19}q_{20} + 32q_4q_5q_{17}q_{18} + 32q_4q_6q_{16}q_{18} + \\
& 32q_4q_7q_{15}q_{18} + 32q_5q_6q_{16}q_{17} + 32q_5q_7q_{15}q_{17} + 32q_6q_7q_{15}q_{16} + 64q_9q_{10}q_{12}q_{13} - 32q_4q_5q_{16}q_{20} - 32q_4q_6q_{16}q_{19} - \\
& 32q_4q_7q_{16}q_{18} - 32q_4q_8q_{16}q_{17} + 32q_4q_5q_{18}q_{19} + 32q_4q_6q_{17}q_{19} + 32q_4q_7q_{16}q_{19} + 32q_4q_8q_{15}q_{19} + 32q_5q_6q_{17}q_{18} + \\
& 32q_5q_7q_{16}q_{18} + 32q_5q_8q_{15}q_{18} + 32q_6q_7q_{16}q_{17} + 32q_6q_8q_{15}q_{17} + 32q_7q_8q_{15}q_{16} + 64q_9q_{10}q_{13}q_{14} + 64q_9q_{11}q_{12}q_{14} + \\
& 64q_{10}q_{11}q_{12}q_{13} - 32q_4q_6q_{17}q_{20} - 32q_4q_7q_{17}q_{19} - 32q_4q_8q_{17}q_{18} + 32q_4q_5q_{19}q_{20} + 32q_4q_6q_{18}q_{20} + 32q_4q_7q_{17}q_{20} + \\
& 32q_4q_8q_{16}q_{20} + 32q_5q_6q_{18}q_{19} + 32q_5q_7q_{17}q_{19} + 32q_5q_8q_{16}q_{19} + 32q_6q_7q_{17}q_{18} + 32q_6q_8q_{16}q_{18} + 32q_7q_8q_{16}q_{17} + \\
& 64q_{10}q_{11}q_{13}q_{14} - 32q_4q_7q_{18}q_{20} - 32q_4q_8q_{18}q_{19} + 32q_5q_6q_{19}q_{20} + 32q_5q_7q_{18}q_{20} + 32q_5q_8q_{17}q_{20} + 32q_6q_7q_{18}q_{19} + \\
& 32q_6q_8q_{17}q_{19} + 32q_7q_8q_{17}q_{18} + 32q_9q_{10}q_{15}q_{16} + 64q_{11}q_{12}q_{13}q_{14} - 32q_4q_8q_{19}q_{20} + 32q_6q_7q_{19}q_{20} + 32q_6q_8q_{18}q_{20} + \\
& 32q_7q_8q_{18}q_{19} + 32q_9q_{10}q_{16}q_{17} + 32q_9q_{11}q_{15}q_{17} + 32q_{10}q_{11}q_{15}q_{16} + 32q_7q_8q_{19}q_{20} + 32q_9q_{10}q_{17}q_{18} + \\
& 32q_9q_{11}q_{16}q_{18} + 32q_9q_{12}q_{15}q_{18} + 32q_{10}q_{11}q_{16}q_{17} + 32q_{10}q_{12}q_{15}q_{17} + 32q_{11}q_{12}q_{15}q_{16} + 32q_9q_{10}q_{18}q_{19} + \\
& 32q_9q_{11}q_{17}q_{19} + 32q_9q_{12}q_{16}q_{19} + 32q_9q_{13}q_{15}q_{19} + 32q_{10}q_{11}q_{17}q_{18} + 32q_{10}q_{12}q_{16}q_{18} + 32q_{10}q_{13}q_{15}q_{18} + \\
& 32q_{11}q_{12}q_{16}q_{17} + 32q_{11}q_{13}q_{15}q_{17} + 32q_{12}q_{13}q_{15}q_{16} + 32q_9q_{10}q_{19}q_{20} + 32q_9q_{11}q_{18}q_{20} + 32q_9q_{12}q_{17}q_{20} + \\
& 32q_9q_{13}q_{16}q_{20} + 32q_9q_{14}q_{15}q_{20} + 32q_{10}q_{11}q_{18}q_{19} + 32q_{10}q_{12}q_{17}q_{19} + 32q_{10}q_{13}q_{16}q_{19} + 32q_{10}q_{14}q_{15}q_{19} + \\
& 32q_{11}q_{12}q_{17}q_{18} + 32q_{11}q_{13}q_{16}q_{18} + 32q_{11}q_{14}q_{15}q_{18} + 32q_{12}q_{13}q_{16}q_{17} + 32q_{12}q_{14}q_{15}q_{17} + 32q_{13}q_{14}q_{15}q_{16} + \\
& 32q_{10}q_{11}q_{19}q_{20} + 32q_{10}q_{12}q_{18}q_{20} + 32q_{10}q_{13}q_{17}q_{20} + 32q_{10}q_{14}q_{16}q_{20} + 32q_{11}q_{12}q_{18}q_{19} + 32q_{11}q_{13}q_{17}q_{19} + \\
& 32q_{11}q_{14}q_{16}q_{19} + 32q_{12}q_{13}q_{17}q_{18} + 32q_{12}q_{14}q_{16}q_{18} + 32q_{13}q_{14}q_{16}q_{17} + 32q_{11}q_{12}q_{19}q_{20} + 32q_{11}q_{13}q_{18}q_{20} + \\
& 32q_{11}q_{14}q_{17}q_{20} + 32q_{12}q_{13}q_{18}q_{19} + 32q_{12}q_{14}q_{17}q_{19} + 32q_{13}q_{14}q_{17}q_{18} + 32q_{12}q_{13}q_{19}q_{20} + 32q_{12}q_{14}q_{18}q_{20} + \\
& 32q_{13}q_{14}q_{18}q_{19} + 32q_{13}q_{14}q_{19}q_{20} + 64q_{15}q_{16}q_{17}q_{18} + 64q_{15}q_{16}q_{18}q_{19} + 64q_{15}q_{16}q_{19}q_{20} + 64q_{15}q_{17}q_{18}q_{20} + \\
& 64q_{16}q_{17}q_{18}q_{19} + 64q_{16}q_{17}q_{19}q_{20} + 64q_{17}q_{18}q_{19}q_{20} + 2056
\end{aligned}$$

A complete expression of $E_2(q)$ in 92-order H matrix using Turyn based method with $\delta = 103, 328$

$$\begin{aligned}
E_2(q) = & 310192q_{21} - 336q_1 - 320q_2 - 264q_3 - 144q_4 - 272q_5 - 248q_6 - 200q_7 - 96q_8 - 328q_9 - \\
& 384q_{10} - 408q_{11} - 408q_{12} - 384q_{13} - 328q_{14} - 328q_{15} - 368q_{16} - 376q_{17} - 368q_{18} - 328q_{19} - 248q_{20} - \\
& 344q_0 + 310144q_{22} + 310112q_{23} + 310016q_{24} + 310056q_{25} + 310040q_{26} + 310024q_{27} + 310040q_{28} + \\
& 310056q_{29} + 310072q_{30} + 310072q_{31} + 310056q_{32} + 310040q_{33} + 310064q_{34} + 310064q_{35} + 310064q_{36} + \\
& 310040q_{37} + 310176q_{38} + 310144q_{39} + 310016q_{40} + 310072q_{41} + 310056q_{42} + 310008q_{43} + 310040q_{44} + \\
& 310056q_{45} + 310072q_{46} + 310072q_{47} + 310056q_{48} + 310040q_{49} + 310056q_{50} + 310080q_{51} + 310056q_{52} + \\
& 310040q_{53} + 310160q_{54} + 310016q_{55} + 310040q_{56} + 310040q_{57} + 310024q_{58} + 310040q_{59} + 310056q_{60} + \\
& 310056q_{61} + 310056q_{62} + 310056q_{63} + 310040q_{64} + 310056q_{65} + 310048q_{66} + 310056q_{67} + 310040q_{68} + \\
& 310016q_{69} + 310008q_{70} + 310008q_{71} + 310024q_{72} + 310040q_{73} + 310040q_{74} + 310040q_{75} + 310040q_{76} + \\
& 310040q_{77} + 310040q_{78} + 310032q_{79} + 310032q_{80} + 310032q_{81} + 310040q_{82} + 310080q_{83} + 310048q_{84} + \\
& 310016q_{85} + 309920q_{86} + 310000q_{87} + 310016q_{88} + 310016q_{89} + 310016q_{90} + 310016q_{91} + 310016q_{92} + \\
& 310016q_{93} + 310016q_{94} + 310016q_{95} + 310016q_{96} + 310192q_{97} + 310128q_{98} + 310064q_{99} + 310024q_{100} + \\
& 310040q_{101} + 310056q_{102} + 310056q_{103} + 310040q_{104} + 310024q_{105} + 310048q_{106} + 310064q_{107} + 310048q_{108} + \\
& 310024q_{109} + 310144q_{110} + 310096q_{111} + 310024q_{112} + 310040q_{113} + 310040q_{114} + 310040q_{115} + 310040q_{116} + \\
& 310024q_{117} + 310040q_{118} + 310048q_{119} + 310040q_{120} + 310024q_{121} + 310160q_{122} + 310024q_{123} + 310024q_{124} + \\
& 310024q_{125} + 310024q_{126} + 310024q_{127} + 310024q_{128} + 310024q_{129} + 310016q_{130} + 310024q_{131} + 310024q_{132} +
\end{aligned}$$

$$\begin{aligned}
& 310008q_{133} + 310008q_{134} + 310008q_{135} + 310008q_{136} + 310000q_{137} + 310000q_{138} + 310192q_{139} + 310160q_{140} + \\
& 310128q_{141} + 310112q_{142} + 310080q_{143} + 310048q_{144} + 310048q_{145} + 310048q_{146} + 310048q_{147} + 310048q_{148} + \\
& 310208q_{149} + 310160q_{150} + 310160q_{151} + 310112q_{152} + 310056q_{153} + 310064q_{154} + 310064q_{155} + 310064q_{156} + \\
& 310056q_{157} + 310224q_{158} + 310160q_{159} + 310128q_{160} + 310056q_{161} + 310072q_{162} + 310080q_{163} + 310072q_{164} + \\
& 310056q_{165} + 310208q_{166} + 310160q_{167} + 310056q_{168} + 310072q_{169} + 310080q_{170} + 310072q_{171} + 310056q_{172} + \\
& 310192q_{173} + 310056q_{174} + 310064q_{175} + 310064q_{176} + 310064q_{177} + 310056q_{178} + 310048q_{179} + 310048q_{180} + \\
& 310048q_{181} + 310048q_{182} + 310048q_{183} + 310184q_{184} + 310152q_{185} + 310136q_{186} + 310104q_{187} + 310056q_{188} + \\
& 310200q_{189} + 310152q_{190} + 310136q_{191} + 310088q_{192} + 310200q_{193} + 310152q_{194} + 310104q_{195} + 310184q_{196} + \\
& 310136q_{197} + 310184q_{198} + 103328q_0q_1 + 103328q_0q_2 + 103328q_0q_3 + 103328q_1q_2 + 103328q_0q_4 + \\
& 103328q_1q_3 + 103328q_0q_5 + 103328q_1q_4 + 103328q_2q_3 + 103328q_0q_6 + 103328q_1q_5 + 103328q_2q_4 + \\
& 103328q_0q_7 + 103328q_1q_6 + 103328q_2q_5 + 103328q_3q_4 + 8q_0q_8 + 103328q_1q_7 + 103328q_2q_6 + 103328q_3q_5 + \\
& 103328q_0q_9 + 8q_1q_8 + 103328q_2q_7 + 103328q_3q_6 + 103328q_4q_5 + 103328q_0q_{10} + 103328q_1q_9 + 8q_2q_8 + \\
& 103328q_3q_7 + 103328q_4q_6 + 103328q_0q_{11} + 103328q_1q_{10} + 103328q_2q_9 + 24q_3q_8 + 103328q_4q_7 + 103328q_5q_6 + \\
& 103328q_0q_{12} + 103328q_1q_{11} + 103328q_2q_{10} + 103328q_3q_9 + 103328q_4q_8 + 103328q_5q_7 + 103328q_0q_{13} + \\
& 103328q_1q_{12} + 103328q_2q_{11} + 103328q_3q_{10} + 103328q_4q_9 + 103328q_5q_8 + 103328q_6q_7 + 56q_0q_{14} + \\
& 103328q_1q_{13} + 103328q_2q_{12} + 103328q_3q_{11} + 103328q_4q_{10} + 103328q_5q_9 + 103328q_6q_8 + 103328q_0q_{15} + \\
& 56q_1q_{14} + 103328q_2q_{13} + 103328q_3q_{12} + 103328q_4q_{11} + 103328q_5q_{10} + 103328q_6q_9 + 103328q_7q_8 + \\
& 103328q_0q_{16} + 103328q_1q_{15} + 56q_2q_{14} + 103328q_3q_{13} + 103328q_4q_{12} + 103328q_5q_{11} + 103328q_6q_{10} + \\
& 103328q_7q_9 + 103328q_0q_{17} + 103328q_1q_{16} + 103328q_2q_{15} + 56q_3q_{14} + 103328q_4q_{13} + 103328q_5q_{12} + \\
& 103328q_6q_{11} + 103328q_7q_{10} + 103328q_8q_9 + 103328q_0q_{18} + 103328q_1q_{17} + 103328q_2q_{16} + 103328q_3q_{15} + \\
& 16q_4q_{14} + 103328q_5q_{13} + 103328q_6q_{12} + 103328q_7q_{11} + 103328q_8q_{10} + 103328q_0q_{19} + 103328q_1q_{18} + \\
& 103328q_2q_{17} + 103328q_3q_{16} + 103328q_4q_{15} + 40q_5q_{14} + 103328q_6q_{13} + 103328q_7q_{12} + 103328q_8q_{11} + \\
& 103328q_9q_{10} + 40q_0q_{20} + 103328q_1q_{19} + 103328q_2q_{18} + 103328q_3q_{17} + 103328q_4q_{16} + 103328q_5q_{15} + \\
& 40q_6q_{14} + 103328q_7q_{13} + 24q_8q_{12} + 103328q_9q_{11} - 206656q_0q_{21} + 40q_1q_{20} + 103328q_2q_{19} + 103328q_3q_{18} + \\
& 103328q_4q_{17} + 103328q_5q_{16} + 103328q_6q_{15} + 40q_7q_{14} + 24q_8q_{13} + 103328q_9q_{12} + 103328q_{10}q_{11} - \\
& 206656q_0q_{22} - 206656q_1q_{21} + 40q_2q_{20} + 103328q_3q_{19} + 103328q_4q_{18} + 103328q_5q_{17} + 103328q_6q_{16} + \\
& 103328q_7q_{15} + 24q_8q_{14} + 103328q_9q_{13} + 103328q_{10}q_{12} - 206656q_0q_{23} - 64q_2q_{21} + 40q_3q_{20} + 103328q_4q_{19} + \\
& 103328q_5q_{18} + 103328q_6q_{17} + 103328q_7q_{16} + 103328q_8q_{15} + 103328q_9q_{14} + 103328q_{10}q_{13} + 103328q_{11}q_{12} - \\
& 206656q_0q_{24} - 206656q_2q_{22} - 96q_3q_{21} + 103328q_5q_{19} + 103328q_6q_{18} + 103328q_7q_{17} + 103328q_8q_{16} + \\
& 103328q_9q_{15} + 103328q_{10}q_{14} + 103328q_{11}q_{13} - 206656q_0q_{25} - 32q_3q_{22} - 32q_4q_{21} + 24q_5q_{20} + 103328q_6q_{19} + \\
& 103328q_7q_{18} + 103328q_8q_{17} + 103328q_9q_{16} + 103328q_{10}q_{15} + 103328q_{11}q_{14} + 103328q_{12}q_{13} - 206656q_0q_{26} - \\
& 206656q_3q_{23} - 32q_5q_{21} + 24q_6q_{20} + 103328q_7q_{19} + 16q_8q_{18} + 103328q_9q_{17} + 103328q_{10}q_{16} + 103328q_{11}q_{15} + \\
& 103328q_{12}q_{14} - 206656q_0q_{27} - 32q_5q_{22} - 32q_6q_{21} + 24q_7q_{20} + 24q_8q_{19} + 103328q_9q_{18} + 103328q_{10}q_{17} + \\
& 103328q_{11}q_{16} + 103328q_{12}q_{15} + 103328q_{13}q_{14} - 206656q_0q_{28} - 206656q_4q_{24} - 16q_5q_{23} - 32q_6q_{22} - \\
& 32q_7q_{21} + 24q_8q_{20} + 103328q_9q_{19} + 103328q_{10}q_{18} + 103328q_{11}q_{17} + 103328q_{12}q_{16} + 103328q_{13}q_{15} - \\
& 206656q_0q_{29} - 16q_5q_{24} + 56q_9q_{20} + 103328q_{10}q_{19} + 103328q_{11}q_{18} + 103328q_{12}q_{17} + 103328q_{13}q_{16} + \\
& 103328q_{14}q_{15} - 206656q_0q_{30} - 206656q_5q_{25} - 16q_6q_{24} - 32q_9q_{21} + 56q_{10}q_{20} + 103328q_{11}q_{19} + 103328q_{12}q_{18} + \\
& 103328q_{13}q_{17} + 103328q_{14}q_{16} - 206656q_0q_{31} - 32q_6q_{25} + 16q_7q_{24} - 16q_8q_{23} - 16q_9q_{22} - 32q_{10}q_{21} + \\
& 56q_{11}q_{20} + 103328q_{12}q_{19} + 103328q_{13}q_{18} + 103328q_{14}q_{17} + 103328q_{15}q_{16} - 206656q_0q_{32} - 206656q_6q_{26} - \\
& 32q_7q_{25} + 16q_8q_{24} - 16q_9q_{23} - 32q_{10}q_{22} - 32q_{11}q_{21} + 56q_{12}q_{20} + 103328q_{13}q_{19} + 103328q_{14}q_{18} + \\
& 103328q_{15}q_{17} - 206656q_0q_{33} - 32q_7q_{26} - 16q_8q_{25} - 16q_{10}q_{23} - 32q_{11}q_{22} - 32q_{12}q_{21} + 56q_{13}q_{20} + \\
& 103328q_{14}q_{19} + 103328q_{15}q_{18} + 103328q_{16}q_{17} - 206656q_0q_{34} - 206656q_7q_{27} - 32q_8q_{26} - 32q_{11}q_{23} - \\
& 32q_{12}q_{22} - 32q_{13}q_{21} + 56q_{14}q_{20} + 103328q_{15}q_{19} + 103328q_{16}q_{18} - 206656q_0q_{35} - 32q_8q_{27} - 32q_{12}q_{23} - \\
& 32q_{13}q_{22} - 32q_{14}q_{21} + 103328q_{15}q_{20} + 103328q_{16}q_{19} + 103328q_{17}q_{18} - 206656q_0q_{36} - 16q_{13}q_{23} - 16q_{14}q_{22} - \\
& 32q_{15}q_{21} + 103328q_{16}q_{20} + 103328q_{17}q_{19} - 206656q_0q_{37} - 206656q_9q_{28} - 16q_{14}q_{23} - 16q_{15}q_{22} - 32q_{16}q_{21} + \\
& 103328q_{17}q_{20} + 103328q_{18}q_{19} - 32q_{10}q_{28} - 16q_{15}q_{23} - 32q_{16}q_{22} - 32q_{17}q_{21} + 103328q_{18}q_{20} - 206656q_1q_{38} - \\
& 206656q_{10}q_{29} - 32q_{11}q_{28} - 16q_{16}q_{23} - 32q_{17}q_{22} - 32q_{18}q_{21} + 103328q_{19}q_{20} - 206656q_1q_{39} - 206656q_2q_{38} - \\
& 32q_{11}q_{29} - 16q_{12}q_{28} - 32q_{17}q_{23} - 32q_{18}q_{22} - 32q_{19}q_{21} - 206656q_1q_{40} - 64q_3q_{38} - 206656q_{11}q_{30} - 32q_{12}q_{29} -
\end{aligned}$$

$$\begin{aligned}
& 16q_{13}q_{28} - 16q_{18}q_{23} - 16q_{19}q_{22} - 16q_{20}q_{21} - 206656q_1q_{41} - 206656q_3q_{39} - 32q_4q_{38} - 32q_{12}q_{30} - 16q_{13}q_{29} + \\
& 16q_{14}q_{28} - 16q_{19}q_{23} - 16q_{20}q_{22} - 206656q_1q_{42} - 32q_5q_{38} - 206656q_{12}q_{31} - 32q_{13}q_{30} - 16q_{14}q_{29} - 16q_{20}q_{23} - \\
& 206656q_1q_{43} - 206656q_4q_{40} - 32q_5q_{39} - 32q_6q_{38} - 32q_{13}q_{31} - 16q_{14}q_{30} - 206656q_1q_{44} - 48q_5q_{40} - \\
& 32q_6q_{39} - 32q_7q_{38} - 206656q_{13}q_{32} - 32q_{14}q_{31} - 206656q_1q_{45} - 206656q_5q_{41} - 32q_{14}q_{32} - 206656q_1q_{46} - \\
& 32q_6q_{41} - 32q_9q_{38} - 206656q_1q_{47} - 206656q_6q_{42} - 32q_7q_{41} + 48q_8q_{40} - 16q_9q_{39} - 32q_{10}q_{38} - 206656q_{15}q_{33} - \\
& 206656q_1q_{48} - 32q_7q_{42} - 32q_8q_{41} - 32q_{10}q_{39} - 32q_{11}q_{38} - 32q_{16}q_{33} - 206656q_1q_{49} - 206656q_7q_{43} - \\
& 32q_8q_{42} - 32q_{11}q_{39} - 32q_{12}q_{38} - 206656q_{16}q_{34} - 32q_{17}q_{33} - 206656q_1q_{50} - 32q_8q_{43} - 32q_{12}q_{39} - 32q_{13}q_{38} - \\
& 32q_{17}q_{34} - 16q_{18}q_{33} - 206656q_1q_{51} - 32q_{13}q_{39} - 32q_{14}q_{38} - 206656q_{17}q_{35} - 32q_{18}q_{34} - 16q_{19}q_{33} - \\
& 206656q_1q_{52} - 206656q_9q_{44} - 16q_{14}q_{39} - 32q_{15}q_{38} - 32q_{18}q_{35} - 16q_{19}q_{34} + 16q_{20}q_{33} - 206656q_1q_{53} - \\
& 32q_{10}q_{44} - 16q_{15}q_{39} - 32q_{16}q_{38} - 206656q_{18}q_{36} - 32q_{19}q_{35} - 16q_{20}q_{34} - 206656q_{10}q_{45} - 32q_{11}q_{44} - \\
& 32q_{16}q_{39} - 32q_{17}q_{38} - 32q_{19}q_{36} - 16q_{20}q_{35} - 206656q_2q_{54} - 32q_{11}q_{45} - 32q_{12}q_{44} - 32q_{17}q_{39} - 32q_{18}q_{38} - \\
& 206656q_{19}q_{37} - 32q_{20}q_{36} - 206656q_2q_{55} - 206656q_3q_{54} - 206656q_{11}q_{46} - 32q_{12}q_{45} + 16q_{13}q_{44} - 32q_{18}q_{39} - \\
& 32q_{19}q_{38} - 32q_{20}q_{37} - 206656q_2q_{56} - 32q_4q_{54} - 32q_{12}q_{46} - 32q_{13}q_{45} - 16q_{19}q_{39} - 16q_{20}q_{38} - 206656q_2q_{57} - \\
& 206656q_4q_{55} - 32q_5q_{54} - 206656q_{12}q_{47} - 32q_{13}q_{46} + 16q_{14}q_{45} - 16q_{20}q_{39} - 206656q_2q_{58} - 16q_5q_{55} - \\
& 32q_6q_{54} - 32q_{13}q_{47} - 32q_{14}q_{46} - 206656q_2q_{59} - 206656q_5q_{56} - 32q_6q_{55} - 32q_7q_{54} - 206656q_{13}q_{48} - \\
& 32q_{14}q_{47} - 206656q_2q_{60} - 32q_6q_{56} + 32q_7q_{55} - 32q_{14}q_{48} - 206656q_2q_{61} - 206656q_6q_{57} - 32q_7q_{56} + 16q_8q_{55} - \\
& 32q_9q_{54} - 206656q_2q_{62} - 32q_7q_{57} - 32q_{10}q_{54} - 206656q_{15}q_{49} - 206656q_2q_{63} - 206656q_7q_{58} - 32q_8q_{57} - \\
& 32q_{11}q_{54} - 32q_{16}q_{49} - 206656q_2q_{64} - 32q_8q_{58} - 32q_{12}q_{54} - 206656q_{16}q_{50} - 32q_{17}q_{49} - 206656q_2q_{65} - \\
& 32q_{13}q_{54} - 32q_{17}q_{50} - 32q_{18}q_{49} - 206656q_2q_{66} - 206656q_9q_{59} - 32q_{14}q_{54} - 206656q_{17}q_{51} - 32q_{18}q_{50} + \\
& 16q_{19}q_{49} - 206656q_2q_{67} - 32q_{10}q_{59} - 32q_{15}q_{54} - 32q_{18}q_{51} - 32q_{19}q_{50} - 206656q_2q_{68} - 206656q_{10}q_{60} - \\
& 32q_{11}q_{59} - 32q_{16}q_{54} - 206656q_{18}q_{52} - 32q_{19}q_{51} + 16q_{20}q_{50} - 32q_{11}q_{60} - 32q_{17}q_{54} - 32q_{19}q_{52} - 32q_{20}q_{51} - \\
& 206656q_3q_{69} - 206656q_{11}q_{61} - 32q_{12}q_{60} - 16q_{13}q_{59} - 32q_{18}q_{54} - 206656q_{19}q_{53} - 32q_{20}q_{52} - 206656q_3q_{70} - \\
& 206656q_4q_{69} - 32q_{12}q_{61} - 32q_{19}q_{54} - 32q_{20}q_{53} - 206656q_3q_{71} - 16q_5q_{69} - 206656q_{12}q_{62} - 32q_{13}q_{61} - \\
& 16q_{14}q_{60} - 16q_{20}q_{54} - 206656q_3q_{72} - 206656q_5q_{70} + 16q_6q_{69} - 32q_{13}q_{62} + 64q_{21}q_{54} - 206656q_3q_{73} - 32q_6q_{70} - \\
& 16q_7q_{69} - 206656q_{13}q_{63} - 32q_{14}q_{62} - 206656q_3q_{74} - 206656q_6q_{71} + 16q_8q_{69} - 32q_{14}q_{63} - 206656q_3q_{75} - \\
& 32q_7q_{71} - 16q_8q_{70} - 206656q_3q_{76} - 206656q_7q_{72} - 206656q_{15}q_{64} - 206656q_3q_{77} - 32q_8q_{72} - 32q_{16}q_{64} - \\
& 206656q_3q_{78} - 206656q_{16}q_{65} - 32q_{17}q_{64} - 206656q_3q_{79} - 206656q_9q_{73} - 32q_{17}q_{65} - 206656q_3q_{80} - \\
& 32q_{10}q_{73} - 206656q_{17}q_{66} - 32q_{18}q_{65} - 16q_{19}q_{64} - 206656q_3q_{81} - 206656q_{10}q_{74} - 32q_{18}q_{66} - 206656q_3q_{82} - \\
& 32q_{11}q_{74} - 16q_{12}q_{73} - 206656q_{18}q_{67} - 32q_{19}q_{66} - 16q_{20}q_{65} - 206656q_{11}q_{75} - 16q_{13}q_{73} - 32q_{19}q_{67} - \\
& 206656q_4q_{83} - 32q_{12}q_{75} - 16q_{13}q_{74} - 16q_{14}q_{73} - 206656q_{19}q_{68} - 32q_{20}q_{67} - 206656q_4q_{84} - 206656q_5q_{83} - \\
& 206656q_{12}q_{76} - 16q_{14}q_{74} - 32q_{20}q_{68} - 206656q_4q_{85} - 64q_6q_{83} - 32q_{13}q_{76} - 16q_{14}q_{75} - 206656q_4q_{86} - \\
& 206656q_6q_{84} - 32q_7q_{83} - 206656q_{13}q_{77} - 206656q_4q_{87} - 64q_7q_{84} - 32q_{14}q_{77} - 206656q_4q_{88} - 206656q_7q_{85} + \\
& 96q_8q_{84} - 16q_9q_{83} - 206656q_4q_{89} - 64q_8q_{85} - 16q_{10}q_{83} - 206656q_{15}q_{78} - 206656q_4q_{90} - 206656q_8q_{86} - \\
& 16q_{10}q_{84} - 16q_{11}q_{83} - 32q_{16}q_{78} - 206656q_4q_{91} + 16q_9q_{86} + 16q_{10}q_{85} - 16q_{12}q_{83} - 206656q_{16}q_{79} - \\
& 206656q_4q_{92} - 206656q_9q_{87} + 16q_{10}q_{86} - 16q_{13}q_{83} - 32q_{17}q_{79} - 16q_{18}q_{78} - 206656q_4q_{93} - 32q_{10}q_{87} + \\
& 16q_{11}q_{86} - 16q_{13}q_{84} - 16q_{14}q_{83} - 206656q_{17}q_{80} - 16q_{19}q_{78} - 206656q_4q_{94} - 206656q_{10}q_{88} + 16q_{12}q_{86} + \\
& 16q_{13}q_{85} - 16q_{15}q_{83} - 32q_{18}q_{80} - 16q_{19}q_{79} - 16q_{20}q_{78} - 206656q_4q_{95} - 32q_{11}q_{88} + 16q_{13}q_{86} - 16q_{16}q_{83} - \\
& 206656q_{18}q_{81} - 16q_{20}q_{79} - 206656q_4q_{96} - 206656q_{11}q_{89} + 16q_{14}q_{86} - 16q_{16}q_{84} - 32q_{17}q_{83} - 32q_{19}q_{81} - \\
& 16q_{20}q_{80} - 32q_{12}q_{89} + 16q_{15}q_{86} + 16q_{16}q_{85} - 16q_{18}q_{83} - 206656q_{19}q_{82} - 206656q_5q_{97} - 206656q_{12}q_{90} + \\
& 16q_{16}q_{86} - 16q_{18}q_{84} - 16q_{19}q_{83} - 32q_{20}q_{82} - 206656q_5q_{98} - 206656q_6q_{97} - 32q_{13}q_{90} + 32q_{17}q_{86} + 16q_{18}q_{85} - \\
& 206656q_5q_{99} - 64q_7q_{97} - 206656q_{13}q_{91} + 16q_{18}q_{86} + 32q_{21}q_{83} - 206656q_5q_{100} - 206656q_7q_{98} - 32q_8q_{97} - \\
& 32q_{14}q_{91} + 16q_{19}q_{86} - 206656q_5q_{101} - 32q_8q_{98} - 32q_9q_{97} + 32q_{22}q_{84} - 206656q_5q_{102} - 206656q_8q_{99} - \\
& 16q_9q_{98} - 32q_{10}q_{97} - 206656q_{15}q_{92} - 32q_{21}q_{86} - 32q_{22}q_{85} - 32q_{23}q_{84} - 206656q_5q_{103} - 16q_9q_{99} - 32q_{10}q_{98} - \\
& 32q_{11}q_{97} - 32q_{16}q_{92} + 32q_{23}q_{85} - 206656q_5q_{104} - 206656q_9q_{100} - 16q_{10}q_{99} - 32q_{11}q_{98} - 32q_{12}q_{97} - \\
& 206656q_{16}q_{93} - 206656q_5q_{105} - 32q_{10}q_{100} - 32q_{11}q_{99} - 32q_{12}q_{98} - 32q_{13}q_{97} - 32q_{17}q_{93} - 206656q_5q_{106} - \\
& 206656q_{10}q_{101} - 32q_{11}q_{100} - 32q_{12}q_{99} - 32q_{13}q_{98} - 32q_{14}q_{97} - 206656q_{17}q_{94} - 206656q_5q_{107} - 32q_{11}q_{101} - \\
& 16q_{12}q_{100} - 16q_{13}q_{99} - 16q_{14}q_{98} - 32q_{15}q_{97} - 32q_{18}q_{94} - 206656q_5q_{108} - 206656q_{11}q_{102} - 32q_{12}q_{101} + \\
& 16q_{13}q_{100} - 16q_{14}q_{99} - 16q_{15}q_{98} - 32q_{16}q_{97} - 206656q_{18}q_{95} - 206656q_5q_{109} - 32q_{12}q_{102} - 16q_{13}q_{101} +
\end{aligned}$$

$$\begin{aligned}
& 16q_{14}q_{100} - 16q_{15}q_{99} - 32q_{16}q_{98} - 32q_{17}q_{97} - 32q_{19}q_{95} - 206656q_{12}q_{103} - 32q_{13}q_{102} + 16q_{14}q_{101} - 16q_{16}q_{99} - \\
& 32q_{17}q_{98} - 32q_{18}q_{97} - 206656q_{19}q_{96} - 206656q_6q_{110} - 32q_{13}q_{103} - 16q_{14}q_{102} - 32q_{17}q_{99} - 32q_{18}q_{98} - \\
& 32q_{19}q_{97} - 32q_{20}q_{96} - 206656q_6q_{111} - 206656q_7q_{110} - 206656q_{13}q_{104} - 32q_{14}q_{103} - 16q_{18}q_{99} - 16q_{19}q_{98} - \\
& 16q_{20}q_{97} - 206656q_6q_{112} - 32q_{14}q_{104} - 16q_{19}q_{99} - 16q_{20}q_{98} + 32q_{21}q_{97} - 206656q_6q_{113} - 206656q_8q_{111} - \\
& 32q_9q_{110} - 16q_{20}q_{99} - 206656q_6q_{114} - 16q_9q_{111} - 32q_{10}q_{110} - 206656q_{15}q_{105} + 32q_{22}q_{98} - 206656q_6q_{115} - \\
& 206656q_9q_{112} - 32q_{10}q_{111} - 32q_{11}q_{110} - 32q_{16}q_{105} + 32q_{38}q_{83} - 206656q_6q_{116} - 32q_{10}q_{112} - 32q_{11}q_{111} - \\
& 32q_{12}q_{110} - 206656q_{16}q_{106} - 32q_{17}q_{105} + 32q_{23}q_{99} - 206656q_6q_{117} - 206656q_{10}q_{113} - 32q_{11}q_{112} - 32q_{12}q_{111} - \\
& 32q_{13}q_{110} - 32q_{17}q_{106} - 16q_{18}q_{105} + 32q_{39}q_{84} - 206656q_6q_{118} - 32q_{11}q_{113} - 32q_{13}q_{111} - 32q_{14}q_{110} - \\
& 206656q_{17}q_{107} - 32q_{18}q_{106} + 16q_{19}q_{105} - 32q_{38}q_{86} - 32q_{39}q_{85} - 206656q_6q_{119} - 206656q_{11}q_{114} - 32q_{12}q_{113} + \\
& 16q_{13}q_{112} - 16q_{14}q_{111} - 32q_{15}q_{110} - 32q_{18}q_{107} - 16q_{19}q_{106} + 16q_{20}q_{105} - 206656q_6q_{120} - 32q_{12}q_{114} - \\
& 16q_{15}q_{111} - 32q_{16}q_{110} - 206656q_{18}q_{108} - 32q_{19}q_{107} + 16q_{20}q_{106} - 206656q_6q_{121} - 206656q_{12}q_{115} - \\
& 32q_{13}q_{114} + 16q_{14}q_{113} - 32q_{16}q_{111} - 32q_{17}q_{110} - 32q_{19}q_{108} - 16q_{20}q_{107} - 32q_{13}q_{115} - 32q_{17}q_{111} - \\
& 32q_{18}q_{110} - 206656q_{19}q_{109} - 32q_{20}q_{108} - 206656q_7q_{122} - 206656q_{13}q_{116} - 32q_{14}q_{115} - 32q_{18}q_{111} - \\
& 32q_{19}q_{110} - 32q_{20}q_{109} - 206656q_7q_{123} - 206656q_8q_{122} - 32q_{14}q_{116} - 16q_{19}q_{111} - 16q_{20}q_{110} - 206656q_7q_{124} - \\
& 32q_9q_{122} - 16q_{20}q_{111} + 32q_{21}q_{110} - 206656q_7q_{125} - 206656q_9q_{123} - 32q_{10}q_{122} - 206656q_{15}q_{117} - \\
& 206656q_7q_{126} - 32q_{10}q_{123} - 32q_{11}q_{122} - 32q_{16}q_{117} + 32q_{22}q_{111} - 206656q_7q_{127} - 206656q_{10}q_{124} - 32q_{12}q_{122} - \\
& 206656q_{16}q_{118} - 32q_{17}q_{117} - 206656q_7q_{128} - 32q_{11}q_{124} - 32q_{13}q_{122} - 32q_{17}q_{118} + 32q_{38}q_{97} - 206656q_7q_{129} - \\
& 206656q_{11}q_{125} - 16q_{13}q_{123} - 32q_{14}q_{122} - 206656q_{17}q_{119} - 32q_{18}q_{118} + 16q_{19}q_{117} - 206656q_7q_{130} - \\
& 32q_{12}q_{125} - 32q_{15}q_{122} - 32q_{18}q_{119} + 32q_{39}q_{98} + 32q_{54}q_{83} - 206656q_7q_{131} - 206656q_{12}q_{126} - 16q_{14}q_{124} - \\
& 32q_{16}q_{122} - 206656q_{18}q_{120} - 32q_{19}q_{119} + 16q_{20}q_{118} - 206656q_7q_{132} - 32q_{13}q_{126} - 32q_{17}q_{122} - 32q_{19}q_{120} - \\
& 206656q_{13}q_{127} - 32q_{18}q_{122} - 206656q_{19}q_{121} - 32q_{20}q_{120} - 32q_{54}q_{86} - 206656q_8q_{133} - 32q_{14}q_{127} - 32q_{19}q_{122} - \\
& 32q_{20}q_{121} - 206656q_8q_{134} - 206656q_9q_{133} - 16q_{20}q_{122} - 206656q_8q_{135} - 206656q_{15}q_{128} + 32q_{21}q_{122} - \\
& 206656q_8q_{136} - 206656q_{10}q_{134} - 32q_{16}q_{128} - 206656q_8q_{137} - 16q_{12}q_{133} - 206656q_{16}q_{129} - 206656q_8q_{138} - \\
& 206656q_{11}q_{135} - 16q_{13}q_{133} - 32q_{17}q_{129} - 16q_{13}q_{134} - 16q_{14}q_{133} - 206656q_{17}q_{130} - 16q_{19}q_{128} - 206656q_9q_{139} - \\
& 16q_{14}q_{134} - 32q_{18}q_{130} + 32q_{38}q_{110} - 206656q_9q_{140} - 206656q_{10}q_{139} - 16q_{14}q_{135} - 206656q_{18}q_{131} - \\
& 16q_{20}q_{129} - 206656q_9q_{141} - 64q_{11}q_{139} - 32q_{19}q_{131} + 32q_{39}q_{111} - 206656q_9q_{142} - 206656q_{11}q_{140} - \\
& 64q_{12}q_{139} - 206656q_{15}q_{136} - 206656q_{19}q_{132} + 32q_{54}q_{97} - 206656q_9q_{143} - 96q_{12}q_{140} - 64q_{13}q_{139} - \\
& 32q_{20}q_{132} - 206656q_9q_{144} - 206656q_{12}q_{141} - 32q_{13}q_{140} - 64q_{14}q_{139} - 206656q_{16}q_{137} - 206656q_9q_{145} - \\
& 64q_{13}q_{141} - 32q_{14}q_{140} - 32q_{15}q_{139} - 16q_{18}q_{136} - 206656q_9q_{146} - 206656q_{13}q_{142} - 32q_{14}q_{141} - 16q_{15}q_{140} - \\
& 32q_{16}q_{139} - 206656q_{17}q_{138} - 16q_{19}q_{136} - 206656q_9q_{147} - 64q_{14}q_{142} - 16q_{15}q_{141} - 32q_{16}q_{140} - 32q_{17}q_{139} - \\
& 16q_{19}q_{137} - 16q_{20}q_{136} - 206656q_9q_{148} - 206656q_{14}q_{143} - 16q_{15}q_{142} - 16q_{16}q_{141} - 32q_{17}q_{140} - 32q_{18}q_{139} - \\
& 16q_{20}q_{137} - 16q_{15}q_{143} - 16q_{16}q_{142} - 32q_{17}q_{141} - 32q_{18}q_{140} - 32q_{19}q_{139} - 16q_{20}q_{138} - 206656q_{10}q_{149} - \\
& 206656q_{15}q_{144} - 16q_{18}q_{141} - 16q_{19}q_{140} - 16q_{20}q_{139} - 206656q_{10}q_{150} - 206656q_{11}q_{149} - 32q_{16}q_{144} - \\
& 16q_{18}q_{142} - 16q_{19}q_{141} - 16q_{20}q_{140} + 32q_{21}q_{139} + 32q_{38}q_{122} - 206656q_{10}q_{151} - 64q_{12}q_{149} - 206656q_{16}q_{145} - \\
& 16q_{17}q_{144} - 16q_{19}q_{142} - 16q_{20}q_{141} - 206656q_{10}q_{152} - 206656q_{12}q_{150} - 96q_{13}q_{149} - 32q_{17}q_{145} - 16q_{18}q_{144} - \\
& 16q_{19}q_{143} - 16q_{20}q_{142} + 32q_{22}q_{140} - 206656q_{10}q_{153} - 96q_{13}q_{150} - 64q_{14}q_{149} - 206656q_{17}q_{146} - 16q_{18}q_{145} - \\
& 16q_{19}q_{144} - 16q_{20}q_{143} - 206656q_{10}q_{154} - 206656q_{13}q_{151} - 32q_{14}q_{150} - 32q_{15}q_{149} - 32q_{18}q_{146} - 16q_{19}q_{145} - \\
& 16q_{20}q_{144} + 32q_{23}q_{141} + 32q_{54}q_{110} - 206656q_{10}q_{155} - 64q_{14}q_{151} - 16q_{15}q_{150} - 32q_{16}q_{149} - 206656q_{18}q_{147} - \\
& 16q_{19}q_{146} - 16q_{20}q_{145} - 206656q_{10}q_{156} - 206656q_{14}q_{152} - 16q_{15}q_{151} - 32q_{16}q_{150} - 32q_{17}q_{149} - 32q_{19}q_{147} - \\
& 16q_{20}q_{146} - 206656q_{10}q_{157} - 16q_{15}q_{152} - 16q_{16}q_{151} - 32q_{17}q_{150} - 32q_{18}q_{149} - 206656q_{19}q_{148} - 16q_{20}q_{147} - \\
& 206656q_{15}q_{153} - 16q_{16}q_{152} - 32q_{17}q_{151} - 32q_{18}q_{150} - 32q_{19}q_{149} - 32q_{20}q_{148} - 206656q_{11}q_{158} - 32q_{16}q_{153} - \\
& 16q_{18}q_{151} - 16q_{19}q_{150} - 16q_{20}q_{149} - 206656q_{11}q_{159} - 206656q_{12}q_{158} - 206656q_{16}q_{154} - 32q_{17}q_{153} - \\
& 16q_{18}q_{152} - 16q_{19}q_{151} - 16q_{20}q_{150} + 32q_{21}q_{149} - 206656q_{11}q_{160} - 64q_{13}q_{158} - 32q_{17}q_{154} - 16q_{18}q_{153} - \\
& 16q_{19}q_{152} - 16q_{20}q_{151} - 206656q_{11}q_{161} - 206656q_{13}q_{159} - 96q_{14}q_{158} - 206656q_{17}q_{155} - 32q_{18}q_{154} - \\
& 16q_{19}q_{153} - 16q_{20}q_{152} + 32q_{22}q_{150} - 206656q_{11}q_{162} - 64q_{14}q_{159} - 32q_{15}q_{158} - 32q_{18}q_{155} - 16q_{19}q_{154} - \\
& 16q_{20}q_{153} - 206656q_{11}q_{163} - 206656q_{14}q_{160} - 16q_{15}q_{159} - 32q_{16}q_{158} - 206656q_{18}q_{156} - 32q_{19}q_{155} - \\
& 16q_{20}q_{154} + 32q_{23}q_{151} - 206656q_{11}q_{164} - 16q_{15}q_{160} - 32q_{16}q_{159} - 32q_{17}q_{158} - 32q_{19}q_{156} - 16q_{20}q_{155} - \\
& 206656q_{11}q_{165} - 206656q_{15}q_{161} - 16q_{16}q_{160} - 32q_{17}q_{159} - 32q_{18}q_{158} - 206656q_{19}q_{157} - 32q_{20}q_{156} +
\end{aligned}$$

$$\begin{aligned}
& 32q_{54}q_{122} - 32q_{16}q_{161} - 32q_{17}q_{160} - 32q_{18}q_{159} - 32q_{19}q_{158} - 32q_{20}q_{157} + 32q_{38}q_{139} - 206656q_{12}q_{166} - \\
& 206656q_{16}q_{162} - 32q_{17}q_{161} - 16q_{18}q_{160} - 16q_{19}q_{159} - 16q_{20}q_{158} - 206656q_{12}q_{167} - 206656q_{13}q_{166} - \\
& 32q_{17}q_{162} - 32q_{18}q_{161} - 16q_{19}q_{160} - 16q_{20}q_{159} + 32q_{21}q_{158} + 32q_{39}q_{140} - 206656q_{12}q_{168} - 64q_{14}q_{166} - \\
& 206656q_{17}q_{163} - 32q_{18}q_{162} - 16q_{19}q_{161} - 16q_{20}q_{160} - 206656q_{12}q_{169} - 206656q_{14}q_{167} - 32q_{15}q_{166} - \\
& 32q_{18}q_{163} - 32q_{19}q_{162} + 32q_{22}q_{159} - 206656q_{12}q_{170} - 16q_{15}q_{167} - 32q_{16}q_{166} - 206656q_{18}q_{164} - 32q_{19}q_{163} - \\
& 16q_{20}q_{162} - 206656q_{12}q_{171} - 206656q_{15}q_{168} - 32q_{16}q_{167} - 32q_{17}q_{166} - 32q_{19}q_{164} - 32q_{20}q_{163} + 32q_{23}q_{160} - \\
& 206656q_{12}q_{172} - 32q_{16}q_{168} - 32q_{17}q_{167} - 32q_{18}q_{166} - 206656q_{19}q_{165} - 32q_{20}q_{164} - 206656q_{16}q_{169} - \\
& 32q_{17}q_{168} - 32q_{18}q_{167} - 32q_{19}q_{166} - 32q_{20}q_{165} - 206656q_{13}q_{173} - 32q_{17}q_{169} - 32q_{18}q_{168} - 16q_{19}q_{167} - \\
& 16q_{20}q_{166} - 206656q_{13}q_{174} - 206656q_{14}q_{173} - 206656q_{17}q_{170} - 32q_{18}q_{169} - 16q_{19}q_{168} - 16q_{20}q_{167} + \\
& 32q_{21}q_{166} + 32q_{38}q_{149} - 206656q_{13}q_{175} - 32q_{15}q_{173} - 32q_{18}q_{170} - 32q_{19}q_{169} - 206656q_{13}q_{176} - 206656q_{15}q_{174} - \\
& 32q_{16}q_{173} - 206656q_{18}q_{171} - 32q_{19}q_{170} - 16q_{20}q_{169} + 32q_{22}q_{167} + 32q_{39}q_{150} - 206656q_{13}q_{177} - 32q_{16}q_{174} - \\
& 32q_{17}q_{173} - 32q_{19}q_{171} - 32q_{20}q_{170} - 206656q_{13}q_{178} - 206656q_{16}q_{175} - 32q_{17}q_{174} - 32q_{18}q_{173} - 206656q_{19}q_{172} - \\
& 32q_{20}q_{171} - 32q_{17}q_{175} - 16q_{18}q_{174} - 32q_{19}q_{173} - 32q_{20}q_{172} - 206656q_{14}q_{179} - 206656q_{17}q_{176} - 32q_{18}q_{175} - \\
& 16q_{19}q_{174} - 16q_{20}q_{173} + 32q_{54}q_{139} + 64q_{83}q_{110} - 206656q_{14}q_{180} - 206656q_{15}q_{179} - 32q_{18}q_{176} - 16q_{19}q_{175} - \\
& 16q_{20}q_{174} + 32q_{21}q_{173} - 64q_{83}q_{111} - 206656q_{14}q_{181} - 32q_{16}q_{179} - 206656q_{18}q_{177} - 32q_{19}q_{176} - 16q_{20}q_{175} - \\
& 206656q_{14}q_{182} - 206656q_{16}q_{180} - 16q_{17}q_{179} - 32q_{19}q_{177} - 16q_{20}q_{176} + 32q_{38}q_{158} - 206656q_{14}q_{183} - \\
& 32q_{17}q_{180} - 16q_{18}q_{179} - 206656q_{19}q_{178} - 32q_{20}q_{177} - 206656q_{17}q_{181} - 16q_{18}q_{180} - 16q_{19}q_{179} - 32q_{20}q_{178} + \\
& 32q_{39}q_{159} - 206656q_{15}q_{184} - 32q_{18}q_{181} - 16q_{19}q_{180} - 16q_{20}q_{179} - 206656q_{15}q_{185} - 206656q_{16}q_{184} - \\
& 206656q_{18}q_{182} - 16q_{19}q_{181} - 16q_{20}q_{180} - 206656q_{15}q_{186} - 64q_{17}q_{184} - 32q_{19}q_{182} - 16q_{20}q_{181} - 206656q_{15}q_{187} - \\
& 206656q_{17}q_{185} - 64q_{18}q_{184} - 206656q_{19}q_{183} - 16q_{20}q_{182} - 206656q_{15}q_{188} - 96q_{18}q_{185} - 64q_{19}q_{184} - \\
& 32q_{20}q_{183} + 32q_{54}q_{149} - 206656q_{18}q_{186} - 32q_{20}q_{184} + 32q_{38}q_{166} - 206656q_{16}q_{189} - 64q_{19}q_{186} - 32q_{20}q_{185} + \\
& 32q_{21}q_{184} + 64q_{83}q_{122} - 206656q_{16}q_{190} - 206656q_{17}q_{189} - 206656q_{19}q_{187} - 32q_{20}q_{186} + 32q_{39}q_{167} - \\
& 64q_{84}q_{122} - 206656q_{16}q_{191} - 64q_{18}q_{189} - 64q_{20}q_{187} + 32q_{22}q_{185} - 206656q_{16}q_{192} - 206656q_{18}q_{190} - \\
& 96q_{19}q_{189} - 206656q_{20}q_{188} - 64q_{19}q_{190} - 32q_{20}q_{189} + 32q_{23}q_{186} - 206656q_{17}q_{193} - 206656q_{19}q_{191} - \\
& 32q_{20}q_{190} + 32q_{21}q_{189} - 206656q_{17}q_{194} - 206656q_{18}q_{193} - 64q_{20}q_{191} + 32q_{38}q_{173} - 206656q_{17}q_{195} - \\
& 64q_{19}q_{193} - 206656q_{20}q_{192} + 32q_{22}q_{190} + 32q_{54}q_{158} - 206656q_{19}q_{194} - 64q_{20}q_{193} - 206656q_{18}q_{196} - \\
& 64q_{20}q_{194} + 32q_{21}q_{193} + 32q_{23}q_{191} - 206656q_{18}q_{197} - 206656q_{19}q_{196} - 206656q_{20}q_{195} - 32q_{20}q_{196} + \\
& 32q_{22}q_{194} - 206656q_{19}q_{198} - 206656q_{20}q_{197} + 32q_{21}q_{196} - 206656q_{20}q_{198} + 32q_{23}q_{195} + 32q_{21}q_{198} + \\
& 32q_{22}q_{197} + 64q_{97}q_{122} + 32q_{54}q_{166} + 32q_{38}q_{184} + 32q_{83}q_{139} + 32q_{39}q_{185} + 32q_{84}q_{140} - 32q_{83}q_{142} - 32q_{84}q_{141} - \\
& 32q_{85}q_{140} - 32q_{86}q_{139} + 32q_{85}q_{141} + 32q_{38}q_{189} + 32q_{54}q_{173} + 32q_{86}q_{142} + 32q_{39}q_{190} + 32q_{38}q_{193} + 32q_{83}q_{149} + \\
& 32q_{39}q_{194} + 32q_{38}q_{196} + 32q_{84}q_{150} - 32q_{83}q_{152} - 32q_{84}q_{151} - 32q_{85}q_{150} - 32q_{86}q_{149} + 32q_{38}q_{198} + 32q_{39}q_{197} + \\
& 32q_{85}q_{151} + 32q_{97}q_{139} + 32q_{54}q_{184} + 32q_{86}q_{152} + 32q_{98}q_{140} + 32q_{99}q_{141} + 32q_{83}q_{158} + 32q_{54}q_{189} + 32q_{84}q_{159} - \\
& 32q_{84}q_{160} - 32q_{85}q_{159} - 32q_{86}q_{158} + 32q_{85}q_{160} + 32q_{97}q_{149} + 32q_{54}q_{193} + 32q_{98}q_{150} + 32q_{83}q_{166} + 32q_{110}q_{139} + \\
& 32q_{54}q_{196} + 32q_{99}q_{151} + 32q_{84}q_{167} + 32q_{111}q_{140} + 32q_{54}q_{198} - 32q_{85}q_{167} - 32q_{86}q_{166} + 32q_{97}q_{158} + 32q_{83}q_{173} + \\
& 32q_{98}q_{159} - 32q_{86}q_{173} + 32q_{99}q_{160} + 32q_{110}q_{149} + 32q_{111}q_{150} + 32q_{122}q_{139} + 32q_{97}q_{166} + 32q_{98}q_{167} + 32q_{83}q_{184} + \\
& 32q_{110}q_{158} + 32q_{84}q_{185} - 32q_{83}q_{187} - 32q_{84}q_{186} - 32q_{85}q_{185} - 32q_{86}q_{184} + 32q_{97}q_{173} + 32q_{111}q_{159} + 32q_{85}q_{186} + \\
& 32q_{122}q_{149} + 32q_{83}q_{189} + 32q_{86}q_{187} + 32q_{84}q_{190} - 32q_{83}q_{192} - 32q_{84}q_{191} - 32q_{85}q_{190} - 32q_{86}q_{189} + 32q_{83}q_{193} + \\
& 32q_{85}q_{191} + 32q_{110}q_{166} + 32q_{84}q_{194} + 32q_{86}q_{192} + 32q_{111}q_{167} + 32q_{83}q_{196} - 32q_{84}q_{195} - 32q_{85}q_{194} - 32q_{86}q_{193} + \\
& 32q_{85}q_{195} + 32q_{122}q_{158} + 32q_{83}q_{198} + 32q_{84}q_{197} + 32q_{97}q_{184} - 32q_{85}q_{197} - 32q_{86}q_{196} + 32q_{98}q_{185} + 32q_{110}q_{173} - \\
& 32q_{86}q_{198} + 32q_{99}q_{186} + 32q_{97}q_{189} + 32q_{98}q_{190} + 32q_{122}q_{166} + 32q_{97}q_{193} + 32q_{99}q_{191} + 32q_{98}q_{194} + 32q_{97}q_{196} + \\
& 32q_{99}q_{195} + 32q_{110}q_{184} + 32q_{97}q_{198} + 32q_{98}q_{197} + 32q_{122}q_{173} + 32q_{111}q_{185} + 64q_{139}q_{158} + 32q_{110}q_{189} + \\
& 32q_{111}q_{190} + 32q_{110}q_{193} + 32q_{111}q_{194} + 64q_{139}q_{166} + 32q_{110}q_{196} + 32q_{122}q_{184} + 64q_{140}q_{167} + 32q_{110}q_{198} + \\
& 32q_{111}q_{197} + 32q_{122}q_{189} + 64q_{139}q_{173} + 32q_{122}q_{193} + 64q_{149}q_{166} + 32q_{122}q_{196} + 32q_{122}q_{198} + 64q_{149}q_{173} + \\
& 32q_{139}q_{184} + 32q_{140}q_{185} + 32q_{141}q_{186} + 32q_{139}q_{189} + 32q_{142}q_{187} + 32q_{140}q_{190} + 32q_{143}q_{188} + 64q_{158}q_{173} + \\
& 32q_{139}q_{193} + 32q_{141}q_{191} + 32q_{149}q_{184} + 32q_{140}q_{194} + 32q_{142}q_{192} + 32q_{139}q_{196} + 32q_{150}q_{185} + 32q_{141}q_{195} + \\
& 32q_{139}q_{198} + 32q_{140}q_{197} + 32q_{151}q_{186} + 32q_{149}q_{189} + 32q_{152}q_{187} + 32q_{150}q_{190} + 32q_{149}q_{193} + 32q_{151}q_{191} + \\
& 32q_{158}q_{184} + 32q_{150}q_{194} + 32q_{152}q_{192} + 32q_{159}q_{185} + 32q_{149}q_{196} + 32q_{151}q_{195} + 32q_{160}q_{186} + 32q_{149}q_{198} + \\
& 32q_{150}q_{197} + 32q_{158}q_{189} + 32q_{159}q_{190} + 32q_{166}q_{184} + 32q_{158}q_{193} + 32q_{160}q_{191} + 32q_{167}q_{185} + 32q_{159}q_{194} +
\end{aligned}$$

$$32q_{158}q_{196} + 32q_{160}q_{195} + 32q_{166}q_{189} + 32q_{158}q_{198} + 32q_{159}q_{197} + 32q_{167}q_{190} + 32q_{173}q_{184} + 32q_{166}q_{193} + 32q_{167}q_{194} + 32q_{166}q_{196} + 32q_{173}q_{189} + 32q_{166}q_{198} + 32q_{167}q_{197} + 32q_{173}q_{193} + 32q_{173}q_{196} + 32q_{173}q_{198} + 64q_{184}q_{193} + 64q_{184}q_{196} + 64q_{184}q_{198} + 64q_{185}q_{197} + 64q_{189}q_{196} + 64q_{189}q_{198} + 64q_{193}q_{198} + 2056$$

A complete expression of $E_2(s)$ in 92-order H matrix using Turyn based method with $\delta = 103, 328$

$$\begin{aligned} E_2(s) = & 439290s_0 + 439286s_1 + 439294s_2 + 439294s_3 + 465068s_4 + 465164s_5 + 465180s_6 + 465172s_7 + \\ & 258382s_8 + 491030s_9 + 491138s_{10} + 491214s_{11} + 465440s_{12} + 465476s_{13} + 258726s_{14} + 516956s_{15} + 517116s_{16} + \\ & 517228s_{17} + 491472s_{18} + 491486s_{19} + 129652s_{20} - 51724s_{21} - 51724s_{22} - 51716s_{23} - 51680s_{24} - 51680s_{25} - \\ & 51676s_{26} - 51676s_{27} - 51672s_{28} - 51676s_{29} - 51688s_{30} - 51692s_{31} - 51692s_{32} - 51672s_{34} - 51680s_{34} - \\ & 51684s_{35} - 51688s_{36} - 51684s_{37} - 51724s_{38} - 51732s_{39} - 51680s_{40} - 51684s_{41} - 51684s_{42} - 51668s_{43} - \\ & 51672s_{44} - 51680s_{45} - 51684s_{46} - 51692s_{47} - 51692s_{48} - 51672s_{49} - 51680s_{50} - 51688s_{51} - 51684s_{52} - \\ & 51684s_{53} - 51748s_{54} - 51680s_{55} - 51676s_{56} - 51676s_{57} - 51676s_{58} - 51672s_{59} - 51680s_{60} - 51684s_{61} - \\ & 51684s_{62} - 51692s_{63} - 51672s_{64} - 51680s_{65} - 51680s_{66} - 51684s_{67} - 51684s_{68} - 51680s_{69} - 51664s_{70} - \\ & 51668s_{71} - 51676s_{72} - 51672s_{73} - 51676s_{74} - 51680s_{75} - 51684s_{76} - 51684s_{77} - 51672s_{78} - 51672s_{79} - \\ & 51676s_{80} - 51680s_{81} - 51684s_{82} - 51728s_{83} - 51696s_{84} - 51656s_{85} - 51608s_{86} - 51664s_{87} - 51672s_{88} - \\ & 51672s_{89} - 51672s_{90} - 51672s_{91} - 51672s_{92} - 51672s_{93} - 51672s_{94} - 51672s_{95} - 51672s_{96} - 51772s_{97} - \\ & 51732s_{98} - 51700s_{99} - 51672s_{100} - 51676s_{101} - 51680s_{102} - 51684s_{104} - 51684s_{104} - 51672s_{105} - 51680s_{106} - \\ & 51684s_{107} - 51680s_{108} - 51676s_{109} - 51772s_{110} - 51708s_{111} - 51672s_{112} - 51680s_{113} - 51676s_{114} - 51676s_{115} - \\ & 51684s_{116} - 51672s_{117} - 51680s_{118} - 51680s_{119} - 51676s_{120} - 51676s_{121} - 51780s_{122} - 51672s_{123} - 51672s_{124} - \\ & 51676s_{125} - 51676s_{127} - 51676s_{127} - 51672s_{128} - 51672s_{129} - 51672s_{130} - 51676s_{131} - 51676s_{132} - \\ & 51664s_{133} - 51668s_{134} - 51672s_{135} - 51664s_{136} - 51664s_{137} - 51668s_{138} - 51796s_{139} - 51756s_{140} - 51724s_{141} - \\ & 51708s_{142} - 51708s_{143} - 51672s_{144} - 51676s_{145} - 51680s_{146} - 51684s_{147} - 51688s_{148} - 51796s_{149} - 51748s_{150} - \\ & 51748s_{151} - 51724s_{152} - 51672s_{153} - 51680s_{154} - 51684s_{155} - 51688s_{156} - 51692s_{157} - 51820s_{158} - 51764s_{159} - \\ & 51748s_{160} - 51672s_{161} - 51680s_{162} - 51688s_{163} - 51692s_{164} - 51692s_{165} - 51836s_{166} - 51796s_{167} - 51672s_{168} - \\ & 51680s_{169} - 51688s_{170} - 51692s_{171} - 51692s_{172} - 51860s_{173} - 51672s_{174} - 51680s_{175} - 51684s_{176} - 51688s_{177} - \\ & 51692s_{178} - 51672s_{179} - 51676s_{180} - 51680s_{181} - 51684s_{182} - 51688s_{183} - 51844s_{184} - 51796s_{176} - \\ & 51756s_{186} - 51724s_{187} - 51708s_{188} - 51844s_{189} - 51788s_{190} - 51764s_{191} - 51732s_{192} - 51860s_{193} - 51796s_{194} - \\ & 51764s_{195} - 51876s_{196} - 51820s_{197} - 51900s_{198} + 25832s_0s_1 + 25832s_0s_2 + 25832s_0s_3 + 25832s_1s_2 + 25832s_0s_4 + \\ & 25832s_1s_3 + 25832s_0s_5 + 25832s_1s_4 + 25832s_2s_3 + 25832s_0s_6 + 25832s_1s_5 + 25832s_2s_4 + 25832s_0s_7 + 25832s_1s_6 + \\ & 25832s_2s_5 + 25832s_3s_4 + 2s_0s_8 + 25832s_1s_7 + 25832s_2s_6 + 25832s_3s_5 + 25832s_0s_9 + 2s_1s_8 + 25832s_2s_7 + \\ & 25832s_3s_6 + 25832s_4s_5 + 25832s_0s_{10} + 25832s_1s_9 + 2s_2s_8 + 25832s_3s_7 + 25832s_4s_6 + 25832s_0s_{11} + 25832s_1s_{10} + \\ & 25832s_2s_9 + 6s_3s_8 + 25832s_4s_7 + 25832s_5s_6 + 25832s_0s_{12} + 25832s_1s_{11} + 25832s_2s_{10} + 25832s_3s_9 + 25832s_4s_8 + \\ & 25832s_5s_7 + 25832s_0s_{13} + 25832s_1s_{12} + 25832s_2s_{11} + 25832s_3s_{10} + 25832s_4s_9 + 25832s_5s_8 + 25832s_6s_7 + \\ & 14s_0s_{14} + 25832s_1s_{13} + 25832s_2s_{12} + 25832s_3s_{11} + 25832s_4s_{10} + 25832s_5s_9 + 25832s_6s_8 + 25832s_0s_{15} + 14s_1s_{14} + \\ & 25832s_2s_{13} + 25832s_3s_{12} + 25832s_4s_{11} + 25832s_5s_{10} + 25832s_6s_9 + 25832s_7s_8 + 25832s_0s_{16} + 25832s_1s_{15} + \\ & 14s_2s_{14} + 25832s_3s_{13} + 25832s_4s_{12} + 25832s_5s_{11} + 25832s_6s_{10} + 25832s_7s_9 + 25832s_0s_{17} + 25832s_1s_{16} + \\ & 25832s_2s_{15} + 14s_3s_{14} + 25832s_4s_{13} + 25832s_5s_{12} + 25832s_6s_{11} + 25832s_7s_{10} + 25832s_8s_9 + 25832s_0s_{18} + \\ & 25832s_1s_{17} + 25832s_2s_{16} + 25832s_3s_{15} + 4s_4s_{14} + 25832s_5s_{13} + 25832s_6s_{12} + 25832s_7s_{11} + 25832s_8s_{10} + \\ & 25832s_0s_{19} + 25832s_1s_{18} + 25832s_2s_{17} + 25832s_3s_{16} + 25832s_4s_{15} + 10s_5s_{14} + 25832s_6s_{13} + 25832s_7s_{12} + \\ & 25832s_8s_{11} + 25832s_9s_{10} + 10s_0s_{20} + 25832s_1s_{19} + 25832s_2s_{18} + 25832s_3s_{17} + 25832s_4s_{16} + 25832s_5s_{15} + 10s_6s_{14} + \\ & 25832s_7s_{13} + 6s_8s_{12} + 25832s_9s_{11} - 51664s_0s_{21} + 10s_1s_{20} + 25832s_2s_{19} + 25832s_3s_{18} + 25832s_4s_{17} + 25832s_5s_{16} + \\ & 25832s_6s_{15} + 10s_7s_{14} + 6s_8s_{13} + 25832s_9s_{12} + 25832s_{10}s_{11} - 51664s_0s_{22} - 51664s_1s_{21} + 10s_2s_{20} + 25832s_3s_{19} + \\ & 25832s_4s_{18} + 25832s_5s_{17} + 25832s_6s_{16} + 25832s_7s_{15} + 6s_8s_{14} + 25832s_9s_{13} + 25832s_{10}s_{12} - 51664s_0s_{23} - 16s_2s_{21} + \\ & 10s_3s_{20} + 25832s_4s_{19} + 25832s_5s_{18} + 25832s_6s_{17} + 25832s_7s_{16} + 25832s_8s_{15} + 25832s_9s_{14} + 25832s_{10}s_{13} + \\ & 25832s_{11}s_{12} - 51664s_0s_{24} - 51664s_2s_{22} - 24s_3s_{21} + 25832s_5s_{19} + 25832s_6s_{18} + 25832s_7s_{17} + 25832s_8s_{16} + \\ & 25832s_9s_{15} + 25832s_{10}s_{14} + 25832s_{11}s_{13} - 51664s_0s_{25} - 8s_3s_{22} - 8s_4s_{21} + 6s_5s_{20} + 25832s_6s_{19} + 25832s_7s_{18} + \\ & 25832s_8s_{17} + 25832s_9s_{16} + 25832s_{10}s_{15} + 25832s_{11}s_{14} + 25832s_{12}s_{13} - 51664s_0s_{26} - 51664s_3s_{23} - 8s_5s_{21} + \end{aligned}$$

$$\begin{aligned}
& 6s_6s_{20} + 25832s_7s_{19} + 4s_8s_{18} + 25832s_9s_{17} + 25832s_{10}s_{16} + 25832s_{11}s_{15} + 25832s_{12}s_{14} - 51664s_{27} - 8s_5s_{22} - \\
& 8s_6s_{21} + 6s_7s_{20} + 6s_8s_{19} + 25832s_9s_{18} + 25832s_{10}s_{17} + 25832s_{11}s_{16} + 25832s_{12}s_{15} + 25832s_{13}s_{14} - 51664s_{28} - \\
& 51664s_{24} - 4s_5s_{23} - 8s_6s_{22} - 8s_7s_{21} + 6s_8s_{20} + 25832s_9s_{19} + 25832s_{10}s_{18} + 25832s_{11}s_{17} + 25832s_{12}s_{16} + \\
& 25832s_{13}s_{15} - 51664s_{29} - 4s_5s_{24} + 14s_9s_{20} + 25832s_{10}s_{19} + 25832s_{11}s_{18} + 25832s_{12}s_{17} + 25832s_{13}s_{16} + \\
& 25832s_{14}s_{15} - 51664s_{30} - 51664s_5s_{25} - 4s_6s_{24} - 8s_9s_{21} + 14s_{10}s_{20} + 25832s_{11}s_{19} + 25832s_{12}s_{18} + 25832s_{13}s_{17} + \\
& 25832s_{14}s_{16} - 51664s_{31} - 8s_6s_{25} + 4s_7s_{24} - 4s_8s_{23} - 4s_9s_{22} - 8s_{10}s_{21} + 14s_{11}s_{20} + 25832s_{12}s_{19} + 25832s_{13}s_{18} + \\
& 25832s_{14}s_{17} + 25832s_{15}s_{16} - 51664s_{32} - 51664s_6s_{26} - 8s_7s_{25} + 4s_8s_{24} - 4s_9s_{23} - 8s_{10}s_{22} - 8s_{11}s_{21} + 14s_{12}s_{20} + \\
& 25832s_{13}s_{19} + 25832s_{14}s_{18} + 25832s_{15}s_{17} - 51664s_{33} - 8s_7s_{26} - 4s_8s_{25} - 4s_{10}s_{23} - 8s_{11}s_{22} - 8s_{12}s_{21} + 14s_{13}s_{20} + \\
& 25832s_{14}s_{19} + 25832s_{15}s_{18} + 25832s_{16}s_{17} - 51664s_{34} - 51664s_7s_{27} - 8s_8s_{26} - 8s_{11}s_{23} - 8s_{12}s_{22} - 8s_{13}s_{21} + \\
& 14s_{14}s_{20} + 25832s_{15}s_{19} + 25832s_{16}s_{18} - 51664s_{35} - 8s_8s_{27} - 8s_{12}s_{23} - 8s_{13}s_{22} - 8s_{14}s_{21} + 25832s_{15}s_{20} + \\
& 25832s_{16}s_{19} + 25832s_{17}s_{18} - 51664s_{36} - 4s_{13}s_{23} - 4s_{14}s_{22} - 8s_{15}s_{21} + 25832s_{16}s_{20} + 25832s_{17}s_{19} - 51664s_{37} - \\
& 51664s_9s_{28} - 4s_{14}s_{23} - 4s_{15}s_{22} - 8s_{16}s_{21} + 25832s_{17}s_{20} + 25832s_{18}s_{19} - 8s_{10}s_{28} - 4s_{15}s_{23} - 8s_{16}s_{22} - 8s_{17}s_{21} + \\
& 25832s_{18}s_{20} - 51664s_{138} - 51664s_{10}s_{29} - 8s_{11}s_{28} - 4s_{16}s_{23} - 8s_{17}s_{22} - 8s_{18}s_{21} + 25832s_{19}s_{20} - 51664s_{139} - \\
& 51664s_2s_{38} - 8s_{11}s_{29} - 4s_{12}s_{28} - 8s_{17}s_{23} - 8s_{18}s_{22} - 8s_{19}s_{21} - 51664s_{140} - 16s_3s_{38} - 51664s_{11}s_{30} - 8s_{12}s_{29} - \\
& 4s_{13}s_{28} - 4s_{18}s_{23} - 4s_{19}s_{22} - 4s_{20}s_{21} - 51664s_{141} - 51664s_3s_{39} - 8s_4s_{38} - 8s_{12}s_{30} - 4s_{13}s_{29} + 4s_{14}s_{28} - 4s_{19}s_{23} - \\
& 4s_{20}s_{22} - 51664s_{142} - 8s_5s_{38} - 51664s_{12}s_{31} - 8s_{13}s_{30} - 4s_{14}s_{29} - 4s_{20}s_{23} - 51664s_{143} - 51664s_4s_{40} - 8s_5s_{39} - \\
& 8s_6s_{38} - 8s_{13}s_{31} - 4s_{14}s_{30} - 51664s_{144} - 12s_5s_{40} - 8s_6s_{39} - 8s_7s_{38} - 51664s_{13}s_{32} - 8s_{14}s_{31} - 51664s_{145} - \\
& 51664s_5s_{41} - 8s_{14}s_{32} - 51664s_{146} - 8s_6s_{41} - 8s_9s_{38} - 51664s_{147} - 51664s_6s_{42} - 8s_7s_{41} + 12s_8s_{40} - 4s_9s_{39} - \\
& 8s_{10}s_{38} - 51664s_{15}s_{24} - 51664s_{148} - 8s_7s_{42} - 8s_8s_{41} - 8s_{10}s_{39} - 8s_{11}s_{38} - 8s_{16}s_{24} - 51664s_{149} - 51664s_7s_{43} - \\
& 8s_8s_{42} - 8s_{11}s_{39} - 8s_{12}s_{38} - 51664s_{16}s_{34} - 8s_{17}s_{24} - 51664s_{150} - 8s_8s_{43} - 8s_{12}s_{39} - 8s_{13}s_{38} - 8s_{17}s_{34} - 4s_{18}s_{24} - \\
& 51664s_{151} - 8s_{13}s_{39} - 8s_{14}s_{38} - 51664s_{17}s_{35} - 8s_{18}s_{34} - 4s_{19}s_{24} - 51664s_{152} - 51664s_9s_{44} - 4s_{14}s_{39} - 8s_{15}s_{38} - \\
& 8s_{18}s_{35} - 4s_{19}s_{34} + 4s_{20}s_{24} - 51664s_{153} - 8s_{10}s_{44} - 4s_{15}s_{39} - 8s_{16}s_{38} - 51664s_{18}s_{36} - 8s_{19}s_{35} - 4s_{20}s_{34} - \\
& 51664s_{10}s_{45} - 8s_{11}s_{44} - 8s_{16}s_{39} - 8s_{17}s_{38} - 8s_{19}s_{36} - 4s_{20}s_{35} - 51664s_2s_{54} - 8s_{11}s_{45} - 8s_{12}s_{44} - 8s_{17}s_{39} - \\
& 8s_{18}s_{38} - 51664s_{19}s_{37} - 8s_{20}s_{36} - 51664s_2s_{55} - 51664s_3s_{54} - 51664s_{11}s_{46} - 8s_{12}s_{45} + 4s_{13}s_{44} - 8s_{18}s_{39} - 8s_{19}s_{38} - \\
& 8s_{20}s_{37} - 51664s_2s_{56} - 8s_4s_{54} - 8s_{12}s_{46} - 8s_{13}s_{45} - 4s_{19}s_{39} - 4s_{20}s_{38} - 51664s_2s_{57} - 51664s_4s_{55} - 8s_5s_{54} - \\
& 51664s_{12}s_{47} - 8s_{13}s_{46} + 4s_{14}s_{45} - 4s_{20}s_{39} - 51664s_2s_{58} - 4s_5s_{55} - 8s_6s_{54} - 8s_{13}s_{47} - 8s_{14}s_{46} - 51664s_2s_{59} - \\
& 51664s_5s_{56} - 8s_6s_{55} - 8s_7s_{54} - 51664s_{13}s_{48} - 8s_{14}s_{47} - 51664s_2s_{60} - 8s_6s_{56} + 8s_7s_{55} - 8s_{14}s_{48} - 51664s_2s_{61} - \\
& 51664s_6s_{57} - 8s_7s_{56} + 4s_8s_{55} - 8s_9s_{54} - 51664s_2s_{62} - 8s_7s_{57} - 8s_{10}s_{54} - 51664s_{15}s_{49} - 51664s_2s_{63} - 51664s_7s_{58} - \\
& 8s_8s_{57} - 8s_{11}s_{54} - 8s_{16}s_{49} - 51664s_2s_{64} - 8s_8s_{58} - 8s_{12}s_{54} - 51664s_{16}s_{50} - 8s_{17}s_{49} - 51664s_2s_{65} - 8s_{13}s_{54} - \\
& 8s_{17}s_{50} - 8s_{18}s_{49} - 51664s_2s_{66} - 51664s_9s_{59} - 8s_{14}s_{54} - 51664s_{17}s_{51} - 8s_{18}s_{50} + 4s_{19}s_{49} - 51664s_2s_{67} - 8s_{10}s_{59} - \\
& 8s_{15}s_{54} - 8s_{18}s_{51} - 8s_{19}s_{50} - 51664s_2s_{68} - 51664s_{10}s_{60} - 8s_{11}s_{59} - 8s_{16}s_{54} - 51664s_{18}s_{52} - 8s_{19}s_{51} + 4s_{20}s_{50} - \\
& 8s_{11}s_{60} - 8s_{17}s_{54} - 8s_{19}s_{52} - 8s_{20}s_{51} - 51664s_3s_{69} - 51664s_{11}s_{61} - 8s_{12}s_{60} - 4s_{13}s_{59} - 8s_{18}s_{54} - 51664s_{19}s_{53} - \\
& 8s_{20}s_{52} - 51664s_3s_{70} - 51664s_4s_{69} - 8s_{12}s_{61} - 8s_{19}s_{54} - 8s_{20}s_{53} - 51664s_3s_{71} - 4s_5s_{69} - 51664s_{12}s_{62} - 8s_{13}s_{61} - \\
& 4s_{14}s_{60} - 4s_{20}s_{54} - 51664s_3s_{72} - 51664s_5s_{70} + 4s_6s_{69} - 8s_{13}s_{62} + 16s_{21}s_{54} - 51664s_3s_{73} - 8s_6s_{70} - 4s_7s_{69} - \\
& 51664s_{13}s_{63} - 8s_{14}s_{62} - 51664s_3s_{74} - 51664s_6s_{71} + 4s_8s_{69} - 8s_{14}s_{63} - 51664s_3s_{75} - 8s_7s_{71} - 4s_8s_{70} - 51664s_3s_{76} - \\
& 51664s_7s_{72} - 51664s_{15}s_{64} - 51664s_3s_{77} - 8s_8s_{72} - 8s_{16}s_{64} - 51664s_3s_{78} - 51664s_{16}s_{65} - 8s_{17}s_{64} - 51664s_3s_{79} - \\
& 51664s_9s_{73} - 8s_{17}s_{65} - 51664s_3s_{80} - 8s_{10}s_{73} - 51664s_{17}s_{66} - 8s_{18}s_{65} - 4s_{19}s_{64} - 51664s_3s_{81} - 51664s_{10}s_{74} - \\
& 8s_{18}s_{66} - 51664s_3s_{82} - 8s_{11}s_{74} - 4s_{12}s_{73} - 51664s_{18}s_{67} - 8s_{19}s_{66} - 4s_{20}s_{65} - 51664s_{11}s_{75} - 4s_{13}s_{73} - 8s_{19}s_{67} - \\
& 51664s_4s_{83} - 8s_{12}s_{75} - 4s_{13}s_{74} - 4s_{14}s_{73} - 51664s_{19}s_{68} - 8s_{20}s_{67} - 51664s_4s_{84} - 51664s_5s_{83} - 51664s_{12}s_{76} - \\
& 4s_{14}s_{74} - 8s_{20}s_{68} - 51664s_4s_{85} - 16s_6s_{83} - 8s_{13}s_{76} - 4s_{14}s_{75} - 51664s_4s_{86} - 51664s_6s_{84} - 8s_7s_{83} - 51664s_{13}s_{77} - \\
& 51664s_4s_{87} - 16s_7s_{84} - 8s_{14}s_{77} - 51664s_4s_{88} - 51664s_7s_{85} + 24s_8s_{84} - 4s_9s_{83} - 51664s_4s_{89} - 16s_8s_{85} - 4s_{10}s_{83} - \\
& 51664s_{15}s_{78} - 51664s_4s_{90} - 51664s_8s_{86} - 4s_{10}s_{84} - 4s_{11}s_{83} - 8s_{16}s_{78} - 51664s_4s_{91} + 4s_9s_{86} + 4s_{10}s_{85} - 4s_{12}s_{83} - \\
& 51664s_{16}s_{79} - 51664s_4s_{92} - 51664s_9s_{87} + 4s_{10}s_{86} - 4s_{13}s_{83} - 8s_{17}s_{79} - 4s_{18}s_{78} - 51664s_4s_{93} - 8s_{10}s_{87} + 4s_{11}s_{86} - \\
& 4s_{13}s_{84} - 4s_{14}s_{83} - 51664s_{17}s_{80} - 4s_{19}s_{78} - 51664s_4s_{94} - 51664s_{10}s_{88} + 4s_{12}s_{86} + 4s_{13}s_{85} - 4s_{15}s_{83} - 8s_{18}s_{80} - \\
& 4s_{19}s_{79} - 4s_{20}s_{78} - 51664s_4s_{95} - 8s_{11}s_{88} + 4s_{13}s_{86} - 4s_{16}s_{83} - 51664s_{18}s_{81} - 4s_{20}s_{79} - 51664s_4s_{96} - 51664s_{11}s_{89} + \\
& 4s_{14}s_{86} - 4s_{16}s_{84} - 8s_{17}s_{83} - 8s_{19}s_{81} - 4s_{20}s_{80} - 8s_{12}s_{89} + 4s_{15}s_{86} + 4s_{16}s_{85} - 4s_{18}s_{83} - 51664s_{19}s_{82} - 51664s_5s_{97} - \\
& 51664s_{12}s_{90} + 4s_{16}s_{86} - 4s_{18}s_{84} - 4s_{19}s_{83} - 8s_{20}s_{82} - 51664s_5s_{98} - 51664s_6s_{97} - 8s_{13}s_{90} + 8s_{17}s_{86} + 4s_{18}s_{85} - \\
& 51664s_5s_{99} - 16s_7s_{97} - 51664s_{13}s_{91} + 4s_{18}s_{86} + 8s_{21}s_{83} - 51664s_5s_{100} - 51664s_7s_{98} - 8s_8s_{97} - 8s_{14}s_{91} + 4s_{19}s_{86} -
\end{aligned}$$

$$\begin{aligned}
& 51664s_5s_{101} - 8s_8s_{98} - 8s_9s_{97} + 8s_{22}s_{84} - 51664s_5s_{102} - 51664s_8s_{99} - 4s_9s_{98} - 8s_{10}s_{97} - 51664s_{15}s_{92} - 8s_{21}s_{86} - \\
& 8s_{22}s_{85} - 8s_{23}s_{84} - 51664s_5s_{94} - 4s_9s_{99} - 8s_{10}s_{98} - 8s_{11}s_{97} - 8s_{16}s_{92} + 8s_{23}s_{85} - 51664s_5s_{104} - 51664s_9s_{100} - \\
& 4s_{10}s_{99} - 8s_{11}s_{98} - 8s_{12}s_{97} - 51664s_{16}s_{93} - 51664s_5s_{105} - 8s_{10}s_{100} - 8s_{11}s_{99} - 8s_{12}s_{98} - 8s_{13}s_{97} - 8s_{17}s_{93} - \\
& 51664s_5s_{106} - 51664s_{10}s_{101} - 8s_{11}s_{100} - 8s_{12}s_{99} - 8s_{13}s_{98} - 8s_{14}s_{97} - 51664s_{17}s_{94} - 51664s_5s_{107} - 8s_{11}s_{101} - \\
& 4s_{12}s_{100} - 4s_{13}s_{99} - 4s_{14}s_{98} - 8s_{15}s_{97} - 8s_{18}s_{94} - 51664s_5s_{108} - 51664s_{11}s_{102} - 8s_{12}s_{101} + 4s_{13}s_{100} - 4s_{14}s_{99} - \\
& 4s_{15}s_{98} - 8s_{16}s_{97} - 51664s_{18}s_{95} - 51664s_5s_{109} - 8s_{12}s_{102} - 4s_{13}s_{101} + 4s_{14}s_{100} - 4s_{15}s_{99} - 8s_{16}s_{98} - 8s_{17}s_{97} - \\
& 8s_{19}s_{95} - 51664s_{12}s_{94} - 8s_{13}s_{102} + 4s_{14}s_{101} - 4s_{16}s_{99} - 8s_{17}s_{98} - 8s_{18}s_{97} - 51664s_{19}s_{96} - 51664s_6s_{110} - 8s_{13}s_{94} - \\
& 4s_{14}s_{102} - 8s_{17}s_{99} - 8s_{18}s_{98} - 8s_{19}s_{97} - 8s_{20}s_{96} - 51664s_6s_{111} - 51664s_7s_{110} - 51664s_{13}s_{104} - 8s_{14}s_{94} - 4s_{18}s_{99} - \\
& 4s_{19}s_{98} - 4s_{20}s_{97} - 51664s_6s_{112} - 8s_{14}s_{104} - 4s_{19}s_{99} - 4s_{20}s_{98} + 8s_{21}s_{97} - 51664s_6s_{113} - 51664s_8s_{111} - 8s_9s_{110} - \\
& 4s_{20}s_{99} - 51664s_6s_{114} - 4s_9s_{111} - 8s_{10}s_{110} - 51664s_{15}s_{105} + 8s_{22}s_{98} - 51664s_6s_{115} - 51664s_9s_{112} - 8s_{10}s_{111} - \\
& 8s_{11}s_{110} - 8s_{16}s_{105} + 8s_{38}s_{83} - 51664s_6s_{116} - 8s_{10}s_{112} - 8s_{11}s_{111} - 8s_{12}s_{110} - 51664s_{16}s_{106} - 8s_{17}s_{105} + 8s_{23}s_{99} - \\
& 51664s_6s_{117} - 51664s_{10}s_{113} - 8s_{11}s_{112} - 8s_{12}s_{111} - 8s_{13}s_{110} - 8s_{17}s_{106} - 4s_{18}s_{105} + 8s_{39}s_{84} - 51664s_6s_{118} - \\
& 8s_{11}s_{113} - 8s_{13}s_{111} - 8s_{14}s_{110} - 51664s_{17}s_{107} - 8s_{18}s_{106} + 4s_{19}s_{105} - 8s_{38}s_{86} - 8s_{39}s_{85} - 51664s_6s_{119} - \\
& 51664s_{11}s_{114} - 8s_{12}s_{113} + 4s_{13}s_{112} - 4s_{14}s_{111} - 8s_{15}s_{110} - 8s_{18}s_{107} - 4s_{19}s_{106} + 4s_{20}s_{105} - 51664s_6s_{120} - \\
& 8s_{12}s_{114} - 4s_{15}s_{111} - 8s_{16}s_{110} - 51664s_{18}s_{108} - 8s_{19}s_{107} + 4s_{20}s_{106} - 51664s_6s_{121} - 51664s_{12}s_{115} - 8s_{13}s_{114} + \\
& 4s_{14}s_{113} - 8s_{16}s_{111} - 8s_{17}s_{110} - 8s_{19}s_{108} - 4s_{20}s_{107} - 8s_{13}s_{115} - 8s_{17}s_{111} - 8s_{18}s_{110} - 51664s_{19}s_{109} - 8s_{20}s_{108} - \\
& 51664s_7s_{122} - 51664s_{13}s_{116} - 8s_{14}s_{115} - 8s_{18}s_{111} - 8s_{19}s_{110} - 8s_{20}s_{109} - 51664s_7s_{123} - 51664s_8s_{122} - 8s_{14}s_{116} - \\
& 4s_{19}s_{111} - 4s_{20}s_{110} - 51664s_7s_{124} - 8s_9s_{122} - 4s_{20}s_{111} + 8s_{21}s_{110} - 51664s_7s_{125} - 51664s_9s_{123} - 8s_{10}s_{122} - \\
& 51664s_{15}s_{117} - 51664s_7s_{117} - 8s_{10}s_{123} - 8s_{11}s_{122} - 8s_{16}s_{117} + 8s_{22}s_{111} - 51664s_7s_{127} - 51664s_{10}s_{124} - 8s_{12}s_{122} - \\
& 51664s_{16}s_{118} - 8s_{17}s_{117} - 51664s_7s_{128} - 8s_{11}s_{124} - 8s_{13}s_{122} - 8s_{17}s_{118} + 8s_{38}s_{97} - 51664s_7s_{129} - 51664s_{11}s_{125} - \\
& 4s_{13}s_{123} - 8s_{14}s_{122} - 51664s_{17}s_{119} - 8s_{18}s_{118} + 4s_{19}s_{117} - 51664s_7s_{130} - 8s_{12}s_{125} - 8s_{15}s_{122} - 8s_{18}s_{119} + 8s_{39}s_{98} + \\
& 8s_{54}s_{83} - 51664s_7s_{131} - 51664s_{12}s_{117} - 4s_{14}s_{124} - 8s_{16}s_{122} - 51664s_{18}s_{120} - 8s_{19}s_{119} + 4s_{20}s_{118} - 51664s_7s_{132} - \\
& 8s_{13}s_{117} - 8s_{17}s_{122} - 8s_{19}s_{120} - 51664s_{13}s_{127} - 8s_{18}s_{122} - 51664s_{19}s_{121} - 8s_{20}s_{120} - 8s_{54}s_{86} - 51664s_8s_{133} - \\
& 8s_{14}s_{127} - 8s_{19}s_{122} - 8s_{20}s_{121} - 51664s_8s_{134} - 51664s_9s_{133} - 4s_{20}s_{122} - 51664s_8s_{135} - 51664s_{15}s_{128} + 8s_{21}s_{122} - \\
& 51664s_8s_{136} - 51664s_{10}s_{134} - 8s_{16}s_{128} - 51664s_8s_{137} - 4s_{12}s_{133} - 51664s_{16}s_{129} - 51664s_8s_{138} - 51664s_{11}s_{135} - \\
& 4s_{13}s_{133} - 8s_{17}s_{129} - 4s_{13}s_{134} - 4s_{14}s_{133} - 51664s_{17}s_{130} - 4s_{19}s_{128} - 51664s_9s_{139} - 4s_{14}s_{134} - 8s_{18}s_{130} + 8s_{38}s_{110} - \\
& 51664s_9s_{140} - 51664s_{10}s_{139} - 4s_{14}s_{135} - 51664s_{18}s_{131} - 4s_{20}s_{129} - 51664s_9s_{141} - 16s_{11}s_{139} - 8s_{19}s_{131} + 8s_{39}s_{111} - \\
& 51664s_9s_{142} - 51664s_{11}s_{140} - 16s_{12}s_{139} - 51664s_{15}s_{136} - 51664s_{19}s_{132} + 8s_{54}s_{97} - 51664s_9s_{143} - 24s_{12}s_{140} - \\
& 16s_{13}s_{139} - 8s_{20}s_{132} - 51664s_9s_{144} - 51664s_{12}s_{141} - 8s_{13}s_{140} - 16s_{14}s_{139} - 51664s_{16}s_{137} - 51664s_9s_{145} - \\
& 16s_{13}s_{141} - 8s_{14}s_{140} - 8s_{15}s_{139} - 4s_{18}s_{136} - 51664s_9s_{146} - 51664s_{13}s_{142} - 8s_{14}s_{141} - 4s_{15}s_{140} - 8s_{16}s_{139} - \\
& 51664s_{17}s_{138} - 4s_{19}s_{136} - 51664s_9s_{147} - 16s_{14}s_{142} - 4s_{15}s_{141} - 8s_{16}s_{140} - 8s_{17}s_{139} - 4s_{19}s_{137} - 4s_{20}s_{136} - \\
& 51664s_9s_{148} - 51664s_{14}s_{143} - 4s_{15}s_{142} - 4s_{16}s_{141} - 8s_{17}s_{140} - 8s_{18}s_{139} - 4s_{20}s_{137} - 4s_{15}s_{143} - 4s_{16}s_{142} - 8s_{17}s_{141} - \\
& 8s_{18}s_{140} - 8s_{19}s_{139} - 4s_{20}s_{138} - 51664s_{10}s_{149} - 51664s_{15}s_{144} - 4s_{18}s_{141} - 4s_{19}s_{140} - 4s_{20}s_{139} - 51664s_{10}s_{150} - \\
& 51664s_{11}s_{149} - 8s_{16}s_{144} - 4s_{18}s_{142} - 4s_{19}s_{141} - 4s_{20}s_{140} + 8s_{21}s_{139} + 8s_{38}s_{122} - 51664s_{10}s_{151} - 16s_{12}s_{149} - \\
& 51664s_{16}s_{145} - 4s_{17}s_{144} - 4s_{19}s_{142} - 4s_{20}s_{141} - 51664s_{10}s_{152} - 51664s_{12}s_{150} - 24s_{13}s_{149} - 8s_{17}s_{145} - 4s_{18}s_{144} - \\
& 4s_{19}s_{143} - 4s_{20}s_{142} + 8s_{22}s_{140} - 51664s_{10}s_{153} - 24s_{13}s_{150} - 16s_{14}s_{149} - 51664s_{17}s_{146} - 4s_{18}s_{145} - 4s_{19}s_{144} - \\
& 4s_{20}s_{143} - 51664s_{10}s_{154} - 51664s_{13}s_{151} - 8s_{14}s_{150} - 8s_{15}s_{149} - 8s_{18}s_{146} - 4s_{19}s_{145} - 4s_{20}s_{144} + 8s_{23}s_{141} + \\
& 8s_{54}s_{110} - 51664s_{10}s_{155} - 16s_{14}s_{151} - 4s_{15}s_{150} - 8s_{16}s_{149} - 51664s_{18}s_{147} - 4s_{19}s_{146} - 4s_{20}s_{145} - 51664s_{10}s_{156} - \\
& 51664s_{14}s_{152} - 4s_{15}s_{151} - 8s_{16}s_{150} - 8s_{17}s_{149} - 8s_{19}s_{147} - 4s_{20}s_{146} - 51664s_{10}s_{157} - 4s_{15}s_{152} - 4s_{16}s_{151} - \\
& 8s_{17}s_{150} - 8s_{18}s_{149} - 51664s_{19}s_{148} - 4s_{20}s_{147} - 51664s_{15}s_{153} - 4s_{16}s_{152} - 8s_{17}s_{151} - 8s_{18}s_{150} - 8s_{19}s_{149} - 8s_{20}s_{148} - \\
& 51664s_{11}s_{158} - 8s_{16}s_{153} - 4s_{18}s_{151} - 4s_{19}s_{150} - 4s_{20}s_{149} - 51664s_{11}s_{159} - 51664s_{12}s_{158} - 51664s_{16}s_{154} - \\
& 8s_{17}s_{153} - 4s_{18}s_{152} - 4s_{19}s_{151} - 4s_{20}s_{150} + 8s_{21}s_{149} - 51664s_{11}s_{160} - 16s_{13}s_{158} - 8s_{17}s_{154} - 4s_{18}s_{153} - 4s_{19}s_{152} - \\
& 4s_{20}s_{151} - 51664s_{11}s_{161} - 51664s_{13}s_{159} - 24s_{14}s_{158} - 51664s_{17}s_{155} - 8s_{18}s_{154} - 4s_{19}s_{153} - 4s_{20}s_{152} + 8s_{22}s_{150} - \\
& 51664s_{11}s_{162} - 16s_{14}s_{159} - 8s_{15}s_{158} - 8s_{18}s_{155} - 4s_{19}s_{154} - 4s_{20}s_{153} - 51664s_{11}s_{163} - 51664s_{14}s_{160} - 4s_{15}s_{159} - \\
& 8s_{16}s_{158} - 51664s_{18}s_{156} - 8s_{19}s_{155} - 4s_{20}s_{154} + 8s_{23}s_{151} - 51664s_{11}s_{164} - 4s_{15}s_{160} - 8s_{16}s_{159} - 8s_{17}s_{158} - 8s_{19}s_{156} - \\
& 4s_{20}s_{155} - 51664s_{11}s_{165} - 51664s_{15}s_{161} - 4s_{16}s_{160} - 8s_{17}s_{159} - 8s_{18}s_{158} - 51664s_{19}s_{157} - 8s_{20}s_{156} + 8s_{54}s_{122} - \\
& 8s_{16}s_{161} - 8s_{17}s_{160} - 8s_{18}s_{159} - 8s_{19}s_{158} - 8s_{20}s_{157} + 8s_{38}s_{139} - 51664s_{12}s_{166} - 51664s_{16}s_{162} - 8s_{17}s_{161} - \\
& 4s_{18}s_{160} - 4s_{19}s_{159} - 4s_{20}s_{158} - 51664s_{12}s_{167} - 51664s_{13}s_{166} - 8s_{17}s_{162} - 8s_{18}s_{161} - 4s_{19}s_{160} - 4s_{20}s_{159} +
\end{aligned}$$

$$\begin{aligned}
& 8s_{21}s_{158} + 8s_{39}s_{140} - 51664s_{12}s_{168} - 16s_{14}s_{166} - 51664s_{17}s_{163} - 8s_{18}s_{162} - 4s_{19}s_{161} - 4s_{20}s_{160} - 51664s_{12}s_{169} - \\
& 51664s_{14}s_{167} - 8s_{15}s_{166} - 8s_{18}s_{163} - 8s_{19}s_{162} + 8s_{22}s_{159} - 51664s_{12}s_{170} - 4s_{15}s_{167} - 8s_{16}s_{166} - 51664s_{18}s_{164} - \\
& 8s_{19}s_{163} - 4s_{20}s_{162} - 51664s_{12}s_{171} - 51664s_{15}s_{168} - 8s_{16}s_{167} - 8s_{17}s_{166} - 8s_{19}s_{164} - 8s_{20}s_{163} + 8s_{23}s_{160} - \\
& 51664s_{12}s_{172} - 8s_{16}s_{168} - 8s_{17}s_{167} - 8s_{18}s_{166} - 51664s_{19}s_{165} - 8s_{20}s_{164} - 51664s_{16}s_{169} - 8s_{17}s_{168} - 8s_{18}s_{167} - \\
& 8s_{19}s_{166} - 8s_{20}s_{165} - 51664s_{13}s_{173} - 8s_{17}s_{169} - 8s_{18}s_{168} - 4s_{19}s_{167} - 4s_{20}s_{166} - 51664s_{13}s_{174} - 51664s_{14}s_{173} - \\
& 51664s_{17}s_{170} - 8s_{18}s_{169} - 4s_{19}s_{168} - 4s_{20}s_{167} + 8s_{21}s_{166} + 8s_{38}s_{149} - 51664s_{13}s_{175} - 8s_{15}s_{173} - 8s_{18}s_{170} - 8s_{19}s_{169} - \\
& 51664s_{13}s_{176} - 51664s_{15}s_{174} - 8s_{16}s_{173} - 51664s_{18}s_{171} - 8s_{19}s_{170} - 4s_{20}s_{169} + 8s_{22}s_{167} + 8s_{39}s_{150} - 51664s_{13}s_{177} - \\
& 8s_{16}s_{174} - 8s_{17}s_{173} - 8s_{19}s_{171} - 8s_{20}s_{170} - 51664s_{13}s_{178} - 51664s_{16}s_{175} - 8s_{17}s_{174} - 8s_{18}s_{173} - 51664s_{19}s_{172} - \\
& 8s_{20}s_{171} - 8s_{17}s_{175} - 4s_{18}s_{174} - 8s_{19}s_{173} - 8s_{20}s_{172} - 51664s_{14}s_{179} - 51664s_{17}s_{176} - 8s_{18}s_{175} - 4s_{19}s_{174} - 4s_{20}s_{173} + \\
& 8s_{54}s_{139} + 16s_{83}s_{110} - 51664s_{14}s_{180} - 51664s_{15}s_{179} - 8s_{18}s_{176} - 4s_{19}s_{175} - 4s_{20}s_{174} + 8s_{21}s_{173} - 16s_{83}s_{111} - \\
& 51664s_{14}s_{181} - 8s_{16}s_{179} - 51664s_{18}s_{177} - 8s_{19}s_{176} - 4s_{20}s_{175} - 51664s_{14}s_{182} - 51664s_{16}s_{180} - 4s_{17}s_{179} - \\
& 8s_{19}s_{177} - 4s_{20}s_{176} + 8s_{38}s_{158} - 51664s_{14}s_{183} - 8s_{17}s_{180} - 4s_{18}s_{179} - 51664s_{19}s_{178} - 8s_{20}s_{177} - 51664s_{17}s_{181} - \\
& 4s_{18}s_{180} - 4s_{19}s_{179} - 8s_{20}s_{178} + 8s_{39}s_{159} - 51664s_{15}s_{184} - 8s_{18}s_{181} - 4s_{19}s_{180} - 4s_{20}s_{179} - 51664s_{15}s_{176} - \\
& 51664s_{16}s_{184} - 51664s_{18}s_{182} - 4s_{19}s_{181} - 4s_{20}s_{180} - 51664s_{15}s_{186} - 16s_{17}s_{184} - 8s_{19}s_{182} - 4s_{20}s_{181} - \\
& 51664s_{15}s_{187} - 51664s_{17}s_{176} - 16s_{18}s_{184} - 51664s_{19}s_{183} - 4s_{20}s_{182} - 51664s_{15}s_{188} - 24s_{18}s_{176} - 16s_{19}s_{184} - \\
& 8s_{20}s_{183} + 8s_{54}s_{149} - 51664s_{18}s_{186} - 8s_{20}s_{184} + 8s_{38}s_{166} - 51664s_{16}s_{189} - 16s_{19}s_{186} - 8s_{20}s_{176} + 8s_{21}s_{184} + \\
& 16s_{83}s_{122} - 51664s_{16}s_{190} - 51664s_{17}s_{189} - 51664s_{19}s_{187} - 8s_{20}s_{186} + 8s_{39}s_{167} - 16s_{84}s_{122} - 51664s_{16}s_{191} - \\
& 16s_{18}s_{189} - 16s_{20}s_{187} + 8s_{22}s_{176} - 51664s_{16}s_{192} - 51664s_{18}s_{190} - 24s_{19}s_{189} - 51664s_{20}s_{188} - 16s_{19}s_{190} - \\
& 8s_{20}s_{189} + 8s_{23}s_{186} - 51664s_{17}s_{193} - 51664s_{19}s_{191} - 8s_{20}s_{190} + 8s_{21}s_{189} - 51664s_{17}s_{194} - 51664s_{18}s_{193} - \\
& 16s_{20}s_{191} + 8s_{38}s_{173} - 51664s_{17}s_{195} - 16s_{19}s_{193} - 51664s_{20}s_{192} + 8s_{22}s_{190} + 8s_{54}s_{158} - 51664s_{19}s_{194} - 16s_{20}s_{193} - \\
& 51664s_{18}s_{196} - 16s_{20}s_{194} + 8s_{21}s_{193} + 8s_{23}s_{191} - 51664s_{18}s_{197} - 51664s_{19}s_{196} - 51664s_{20}s_{195} - 8s_{20}s_{196} + \\
& 8s_{22}s_{194} - 51664s_{19}s_{198} - 51664s_{20}s_{197} + 8s_{21}s_{196} - 51664s_{20}s_{198} + 8s_{23}s_{195} + 8s_{21}s_{198} + 8s_{22}s_{197} + 16s_{97}s_{122} + \\
& 8s_{54}s_{166} + 8s_{38}s_{184} + 8s_{83}s_{139} + 8s_{39}s_{176} + 8s_{84}s_{140} - 8s_{83}s_{142} - 8s_{84}s_{141} - 8s_{85}s_{140} - 8s_{86}s_{139} + 8s_{85}s_{141} + 8s_{38}s_{189} + \\
& 8s_{54}s_{173} + 8s_{86}s_{142} + 8s_{39}s_{190} + 8s_{38}s_{193} + 8s_{83}s_{149} + 8s_{39}s_{194} + 8s_{38}s_{196} + 8s_{84}s_{150} - 8s_{83}s_{152} - 8s_{84}s_{151} - 8s_{85}s_{150} - \\
& 8s_{86}s_{149} + 8s_{38}s_{198} + 8s_{39}s_{197} + 8s_{85}s_{151} + 8s_{97}s_{139} + 8s_{54}s_{184} + 8s_{86}s_{152} + 8s_{98}s_{140} + 8s_{99}s_{141} + 8s_{83}s_{158} + 8s_{54}s_{189} + \\
& 8s_{84}s_{159} - 8s_{84}s_{160} - 8s_{85}s_{159} - 8s_{86}s_{158} + 8s_{85}s_{160} + 8s_{97}s_{149} + 8s_{54}s_{193} + 8s_{98}s_{150} + 8s_{83}s_{166} + 8s_{110}s_{139} + 8s_{54}s_{196} + \\
& 8s_{99}s_{151} + 8s_{84}s_{167} + 8s_{111}s_{140} + 8s_{54}s_{198} - 8s_{85}s_{167} - 8s_{86}s_{166} + 8s_{97}s_{158} + 8s_{83}s_{173} + 8s_{98}s_{159} - 8s_{86}s_{173} + 8s_{99}s_{160} + \\
& 8s_{110}s_{149} + 8s_{111}s_{150} + 8s_{122}s_{139} + 8s_{97}s_{166} + 8s_{98}s_{167} + 8s_{83}s_{184} + 8s_{110}s_{158} + 8s_{84}s_{176} - 8s_{83}s_{187} - 8s_{84}s_{186} - \\
& 8s_{85}s_{176} - 8s_{86}s_{184} + 8s_{97}s_{173} + 8s_{111}s_{159} + 8s_{85}s_{186} + 8s_{122}s_{149} + 8s_{83}s_{189} + 8s_{86}s_{187} + 8s_{84}s_{190} - 8s_{83}s_{192} - \\
& 8s_{84}s_{191} - 8s_{85}s_{190} - 8s_{86}s_{189} + 8s_{83}s_{193} + 8s_{85}s_{191} + 8s_{110}s_{166} + 8s_{84}s_{194} + 8s_{86}s_{192} + 8s_{111}s_{167} + 8s_{83}s_{196} - \\
& 8s_{84}s_{195} - 8s_{85}s_{194} - 8s_{86}s_{193} + 8s_{85}s_{195} + 8s_{122}s_{158} + 8s_{83}s_{198} + 8s_{84}s_{197} + 8s_{97}s_{184} - 8s_{85}s_{197} - 8s_{86}s_{196} + 8s_{98}s_{176} + \\
& 8s_{110}s_{173} - 8s_{86}s_{198} + 8s_{99}s_{186} + 8s_{97}s_{189} + 8s_{98}s_{190} + 8s_{122}s_{166} + 8s_{97}s_{193} + 8s_{99}s_{191} + 8s_{98}s_{194} + 8s_{97}s_{196} + 8s_{99}s_{195} + \\
& 8s_{110}s_{184} + 8s_{97}s_{198} + 8s_{98}s_{197} + 8s_{122}s_{173} + 8s_{111}s_{176} + 16s_{139}s_{158} + 8s_{110}s_{189} + 8s_{111}s_{190} + 8s_{110}s_{193} + 8s_{111}s_{194} + \\
& 16s_{139}s_{166} + 8s_{110}s_{196} + 8s_{122}s_{184} + 16s_{140}s_{167} + 8s_{110}s_{198} + 8s_{111}s_{197} + 8s_{122}s_{189} + 16s_{139}s_{173} + 8s_{122}s_{193} + \\
& 16s_{149}s_{166} + 8s_{122}s_{196} + 8s_{122}s_{198} + 16s_{149}s_{173} + 8s_{139}s_{184} + 8s_{140}s_{176} + 8s_{141}s_{186} + 8s_{139}s_{189} + 8s_{142}s_{187} + \\
& 8s_{140}s_{190} + 8s_{143}s_{188} + 16s_{158}s_{173} + 8s_{139}s_{193} + 8s_{141}s_{191} + 8s_{149}s_{184} + 8s_{140}s_{194} + 8s_{142}s_{192} + 8s_{139}s_{196} + 8s_{150}s_{176} + \\
& 8s_{141}s_{195} + 8s_{139}s_{198} + 8s_{140}s_{197} + 8s_{151}s_{186} + 8s_{149}s_{189} + 8s_{152}s_{187} + 8s_{150}s_{190} + 8s_{149}s_{193} + 8s_{151}s_{191} + 8s_{158}s_{184} + \\
& 8s_{150}s_{194} + 8s_{152}s_{192} + 8s_{159}s_{176} + 8s_{149}s_{196} + 8s_{151}s_{195} + 8s_{160}s_{186} + 8s_{149}s_{198} + 8s_{150}s_{197} + 8s_{158}s_{189} + 8s_{159}s_{190} + \\
& 8s_{166}s_{184} + 8s_{158}s_{193} + 8s_{160}s_{191} + 8s_{167}s_{176} + 8s_{159}s_{194} + 8s_{158}s_{196} + 8s_{160}s_{195} + 8s_{166}s_{189} + 8s_{158}s_{198} + 8s_{159}s_{197} + \\
& 8s_{167}s_{190} + 8s_{173}s_{184} + 8s_{166}s_{193} + 8s_{167}s_{194} + 8s_{166}s_{196} + 8s_{173}s_{189} + 8s_{166}s_{198} + 8s_{167}s_{197} + 8s_{173}s_{193} + 8s_{173}s_{196} + \\
& 8s_{173}s_{198} + 16s_{184}s_{193} + 16s_{184}s_{196} + 16s_{184}s_{198} + 16s_{176}s_{197} + 16s_{189}s_{196} + 16s_{189}s_{198} + 16s_{193}s_{198} + 13798138
\end{aligned}$$

A complete expression of $\hat{H}_2(\hat{\sigma}^z)$ in 92-order H matrix using Turyn based method with $\delta = 103, 328$

$$\begin{aligned}
\hat{H}_2(\hat{\sigma}^z) = & 439290\hat{\sigma}_0^z + 439286\hat{\sigma}_1^z + 439294\hat{\sigma}_2^z + 439294\hat{\sigma}_3^z + 465068\hat{\sigma}_4^z + 465164\hat{\sigma}_5^z + 465180\hat{\sigma}_6^z + 465172\hat{\sigma}_7^z + \\
& 258382\hat{\sigma}_8^z + 491030\hat{\sigma}_9^z + 491138\hat{\sigma}_{10}^z + 491214\hat{\sigma}_{11}^z + 465440\hat{\sigma}_{12}^z + 465476\hat{\sigma}_{13}^z + 258726\hat{\sigma}_{14}^z + 516956\hat{\sigma}_{15}^z + \\
& 517116\hat{\sigma}_{16}^z + 517228\hat{\sigma}_{17}^z + 491472\hat{\sigma}_{18}^z + 491486\hat{\sigma}_{19}^z + 129652\hat{\sigma}_{20}^z - 51724\hat{\sigma}_{21}^z - 51724\hat{\sigma}_{22}^z - 51716\hat{\sigma}_{23}^z - \\
& 51680\hat{\sigma}_{24}^z - 51680\hat{\sigma}_{25}^z - 51676\hat{\sigma}_{26}^z - 51676\hat{\sigma}_{27}^z - 51672\hat{\sigma}_{28}^z - 51676\hat{\sigma}_{29}^z - 51688\hat{\sigma}_{30}^z - 51692\hat{\sigma}_{31}^z - 51692\hat{\sigma}_{32}^z -
\end{aligned}$$

51672 $\hat{\sigma}_2^4$ - 51680 $\hat{\sigma}_{34}^4$ - 51684 $\hat{\sigma}_{35}^4$ - 51688 $\hat{\sigma}_{36}^4$ - 51684 $\hat{\sigma}_{37}^4$ - 51724 $\hat{\sigma}_{38}^4$ - 51732 $\hat{\sigma}_{39}^4$ - 51680 $\hat{\sigma}_{40}^4$ - 51684 $\hat{\sigma}_{41}^4$ - 51684 $\hat{\sigma}_{42}^4$ - 51668 $\hat{\sigma}_{43}^4$ - 51672 $\hat{\sigma}_{44}^4$ - 51680 $\hat{\sigma}_{45}^4$ - 51684 $\hat{\sigma}_{46}^4$ - 51692 $\hat{\sigma}_{47}^4$ - 51692 $\hat{\sigma}_{48}^4$ - 51672 $\hat{\sigma}_{49}^4$ - 51680 $\hat{\sigma}_{50}^4$ - 51688 $\hat{\sigma}_{51}^4$ - 51684 $\hat{\sigma}_{52}^4$ - 51684 $\hat{\sigma}_{53}^4$ - 51748 $\hat{\sigma}_{54}^4$ - 51680 $\hat{\sigma}_{55}^4$ - 51676 $\hat{\sigma}_{56}^4$ - 51676 $\hat{\sigma}_{57}^4$ - 51676 $\hat{\sigma}_{58}^4$ - 51672 $\hat{\sigma}_{59}^4$ - 51680 $\hat{\sigma}_{60}^4$ - 51684 $\hat{\sigma}_{61}^4$ - 51684 $\hat{\sigma}_{62}^4$ - 51692 $\hat{\sigma}_{63}^4$ - 51672 $\hat{\sigma}_{64}^4$ - 51680 $\hat{\sigma}_{65}^4$ - 51680 $\hat{\sigma}_{66}^4$ - 51684 $\hat{\sigma}_{67}^4$ - 51684 $\hat{\sigma}_{68}^4$ - 51680 $\hat{\sigma}_{69}^4$ - 51664 $\hat{\sigma}_{70}^4$ - 51668 $\hat{\sigma}_{71}^4$ - 51676 $\hat{\sigma}_{72}^4$ - 51672 $\hat{\sigma}_{73}^4$ - 51676 $\hat{\sigma}_{74}^4$ - 51680 $\hat{\sigma}_{75}^4$ - 51684 $\hat{\sigma}_{76}^4$ - 51684 $\hat{\sigma}_{77}^4$ - 51672 $\hat{\sigma}_{78}^4$ - 51672 $\hat{\sigma}_{79}^4$ - 51676 $\hat{\sigma}_{80}^4$ - 51680 $\hat{\sigma}_{81}^4$ - 51684 $\hat{\sigma}_{82}^4$ - 51728 $\hat{\sigma}_{83}^4$ - 51696 $\hat{\sigma}_{84}^4$ - 51656 $\hat{\sigma}_{85}^4$ - 51608 $\hat{\sigma}_{86}^4$ - 51664 $\hat{\sigma}_{87}^4$ - 51672 $\hat{\sigma}_{88}^4$ - 51672 $\hat{\sigma}_{89}^4$ - 51672 $\hat{\sigma}_{90}^4$ - 51672 $\hat{\sigma}_{91}^4$ - 51672 $\hat{\sigma}_{92}^4$ - 51672 $\hat{\sigma}_{93}^4$ - 51672 $\hat{\sigma}_{94}^4$ - 51672 $\hat{\sigma}_{95}^4$ - 51672 $\hat{\sigma}_{96}^4$ - 51772 $\hat{\sigma}_{97}^4$ - 51732 $\hat{\sigma}_{98}^4$ - 51700 $\hat{\sigma}_{99}^4$ - 51672 $\hat{\sigma}_{100}^4$ - 51676 $\hat{\sigma}_{101}^4$ - 51680 $\hat{\sigma}_{102}^4$ - 51684 $\hat{\sigma}_{103}^4$ - 51684 $\hat{\sigma}_{104}^4$ - 51672 $\hat{\sigma}_{105}^4$ - 51680 $\hat{\sigma}_{106}^4$ - 51684 $\hat{\sigma}_{107}^4$ - 51680 $\hat{\sigma}_{108}^4$ - 51676 $\hat{\sigma}_{109}^4$ - 51772 $\hat{\sigma}_{110}^4$ - 51708 $\hat{\sigma}_{111}^4$ - 51672 $\hat{\sigma}_{112}^4$ - 51680 $\hat{\sigma}_{113}^4$ - 51676 $\hat{\sigma}_{114}^4$ - 51676 $\hat{\sigma}_{115}^4$ - 51684 $\hat{\sigma}_{116}^4$ - 51672 $\hat{\sigma}_{117}^4$ - 51680 $\hat{\sigma}_{118}^4$ - 51680 $\hat{\sigma}_{119}^4$ - 51676 $\hat{\sigma}_{120}^4$ - 51676 $\hat{\sigma}_{121}^4$ - 51780 $\hat{\sigma}_{122}^4$ - 51672 $\hat{\sigma}_{123}^4$ - 51672 $\hat{\sigma}_{124}^4$ - 51676 $\hat{\sigma}_{125}^4$ - 51676 $\hat{\sigma}_{126}^4$ - 51676 $\hat{\sigma}_{127}^4$ - 51672 $\hat{\sigma}_{128}^4$ - 51672 $\hat{\sigma}_{129}^4$ - 51672 $\hat{\sigma}_{130}^4$ - 51676 $\hat{\sigma}_{131}^4$ - 51676 $\hat{\sigma}_{132}^4$ - 51664 $\hat{\sigma}_{133}^4$ - 51668 $\hat{\sigma}_{134}^4$ - 51672 $\hat{\sigma}_{135}^4$ - 51664 $\hat{\sigma}_{136}^4$ - 51664 $\hat{\sigma}_{137}^4$ - 51668 $\hat{\sigma}_{138}^4$ - 51796 $\hat{\sigma}_{139}^4$ - 51756 $\hat{\sigma}_{140}^4$ - 51724 $\hat{\sigma}_{141}^4$ - 51708 $\hat{\sigma}_{142}^4$ - 51708 $\hat{\sigma}_{143}^4$ - 51672 $\hat{\sigma}_{144}^4$ - 51676 $\hat{\sigma}_{145}^4$ - 51680 $\hat{\sigma}_{146}^4$ - 51684 $\hat{\sigma}_{147}^4$ - 51688 $\hat{\sigma}_{148}^4$ - 51796 $\hat{\sigma}_{149}^4$ - 51748 $\hat{\sigma}_{150}^4$ - 51748 $\hat{\sigma}_{151}^4$ - 51724 $\hat{\sigma}_{152}^4$ - 51672 $\hat{\sigma}_{153}^4$ - 51680 $\hat{\sigma}_{154}^4$ - 51684 $\hat{\sigma}_{155}^4$ - 51688 $\hat{\sigma}_{156}^4$ - 51692 $\hat{\sigma}_{157}^4$ - 51820 $\hat{\sigma}_{158}^4$ - 51764 $\hat{\sigma}_{159}^4$ - 51748 $\hat{\sigma}_{160}^4$ - 51672 $\hat{\sigma}_{161}^4$ - 51680 $\hat{\sigma}_{162}^4$ - 51688 $\hat{\sigma}_{163}^4$ - 51692 $\hat{\sigma}_{164}^4$ - 51692 $\hat{\sigma}_{165}^4$ - 51836 $\hat{\sigma}_{166}^4$ - 51796 $\hat{\sigma}_{167}^4$ - 51672 $\hat{\sigma}_{168}^4$ - 51680 $\hat{\sigma}_{169}^4$ - 51688 $\hat{\sigma}_{170}^4$ - 51692 $\hat{\sigma}_{171}^4$ - 51692 $\hat{\sigma}_{172}^4$ - 51860 $\hat{\sigma}_{173}^4$ - 51672 $\hat{\sigma}_{174}^4$ - 51680 $\hat{\sigma}_{175}^4$ - 51684 $\hat{\sigma}_{176}^4$ - 51688 $\hat{\sigma}_{177}^4$ - 51692 $\hat{\sigma}_{178}^4$ - 51672 $\hat{\sigma}_{179}^4$ - 51676 $\hat{\sigma}_{180}^4$ - 51680 $\hat{\sigma}_{181}^4$ - 51684 $\hat{\sigma}_{182}^4$ - 51688 $\hat{\sigma}_{183}^4$ - 51844 $\hat{\sigma}_{184}^4$ - 51796 $\hat{\sigma}_{185}^4$ - 51756 $\hat{\sigma}_{186}^4$ - 51724 $\hat{\sigma}_{187}^4$ - 51708 $\hat{\sigma}_{188}^4$ - 51844 $\hat{\sigma}_{189}^4$ - 51788 $\hat{\sigma}_{190}^4$ - 51764 $\hat{\sigma}_{191}^4$ - 51732 $\hat{\sigma}_{192}^4$ - 51860 $\hat{\sigma}_{193}^4$ - 51796 $\hat{\sigma}_{194}^4$ - 51764 $\hat{\sigma}_{195}^4$ - 51876 $\hat{\sigma}_{196}^4$ - 51820 $\hat{\sigma}_{197}^4$ - 51900 $\hat{\sigma}_{198}^4$ + 25832 $\hat{\sigma}_{01}^4$ + 25832 $\hat{\sigma}_0^4 \hat{\sigma}_2^4$ + 25832 $\hat{\sigma}_0^4 \hat{\sigma}_3^4$ + 25832 $\hat{\sigma}_1^4 \hat{\sigma}_2^4$ + 25832 $\hat{\sigma}_0^4 \hat{\sigma}_4^4$ + 25832 $\hat{\sigma}_1^4 \hat{\sigma}_3^4$ + 25832 $\hat{\sigma}_2^4 \hat{\sigma}_5^4$ + 25832 $\hat{\sigma}_1^4 \hat{\sigma}_4^4$ + 25832 $\hat{\sigma}_2^4 \hat{\sigma}_3^4$ + 25832 $\hat{\sigma}_0^4 \hat{\sigma}_6^4$ + 25832 $\hat{\sigma}_1^4 \hat{\sigma}_5^4$ + 25832 $\hat{\sigma}_2^4 \hat{\sigma}_4^4$ + 25832 $\hat{\sigma}_0^4$

[illegible]

[illegible]

$$\begin{aligned}
& -8\sigma_{20}^{156} + 8\sigma_{54}^{122} - 8\sigma_{16}^{161} - 8\sigma_{17}^{160} - 8\sigma_{18}^{159} - 8\sigma_{19}^{158} - 8\sigma_{20}^{157} + 8\sigma_{38}^{139} - 51664\sigma_{12}^{166} - \\
& 51664\sigma_{16}^{162} - 8\sigma_{17}^{161} - 4\sigma_{18}^{160} - 4\sigma_{19}^{159} - 4\sigma_{20}^{158} + 51664\sigma_{12}^{167} - 51664\sigma_{13}^{166} - 8\sigma_{17}^{162} - \\
& 8\sigma_{18}^{161} - 4\sigma_{19}^{160} - 4\sigma_{20}^{159} + 8\sigma_{21}^{158} + 8\sigma_{39}^{140} - 51664\sigma_{12}^{168} - 16\sigma_{14}^{166} + 51664\sigma_{17}^{163} - \\
& 8\sigma_{18}^{162} - 4\sigma_{19}^{161} - 4\sigma_{20}^{160} - 51664\sigma_{12}^{169} - 51664\sigma_{14}^{167} - 8\sigma_{15}^{166} - 8\sigma_{18}^{163} - 8\sigma_{19}^{162} + 8\sigma_{22}^{159} - \\
& 51664\sigma_{12}^{170} - 4\sigma_{15}^{167} - 8\sigma_{16}^{166} - 51664\sigma_{18}^{164} - 8\sigma_{19}^{163} - 4\sigma_{20}^{162} - 51664\sigma_{12}^{171} - 51664\sigma_{15}^{168} - \\
& 8\sigma_{16}^{167} - 8\sigma_{17}^{166} - 8\sigma_{19}^{164} - 8\sigma_{20}^{163} + 8\sigma_{23}^{160} - 51664\sigma_{12}^{172} - 8\sigma_{16}^{168} - 8\sigma_{17}^{167} - 8\sigma_{18}^{166} - \\
& 51664\sigma_{19}^{165} - 8\sigma_{20}^{164} - 51664\sigma_{16}^{169} - 8\sigma_{17}^{168} - 8\sigma_{18}^{167} - 8\sigma_{19}^{166} - 8\sigma_{20}^{165} + 51664\sigma_{13}^{173} - \\
& 8\sigma_{17}^{169} - 8\sigma_{18}^{168} - 4\sigma_{19}^{167} - 4\sigma_{20}^{166} - 51664\sigma_{13}^{174} - 51664\sigma_{14}^{173} - 51664\sigma_{17}^{170} - 8\sigma_{18}^{169} - \\
& 4\sigma_{19}^{168} - 4\sigma_{20}^{167} + 8\sigma_{21}^{166} + 8\sigma_{38}^{149} - 51664\sigma_{13}^{175} - 8\sigma_{15}^{173} - 8\sigma_{18}^{170} - 8\sigma_{19}^{169} - 51664\sigma_{13}^{176} - \\
& 51664\sigma_{15}^{174} - 8\sigma_{16}^{173} - 51664\sigma_{18}^{171} - 8\sigma_{19}^{170} - 4\sigma_{20}^{169} + 8\sigma_{22}^{167} + 8\sigma_{39}^{150} - 51664\sigma_{13}^{177} - \\
& 8\sigma_{16}^{174} - 8\sigma_{17}^{173} - 8\sigma_{19}^{171} - 8\sigma_{20}^{170} - 51664\sigma_{13}^{178} - 51664\sigma_{16}^{175} - 8\sigma_{17}^{174} - 8\sigma_{18}^{173} - \\
& 51664\sigma_{19}^{172} - 8\sigma_{20}^{171} - 8\sigma_{17}^{175} - 4\sigma_{18}^{174} - 8\sigma_{19}^{173} - 8\sigma_{20}^{172} - 51664\sigma_{14}^{179} - 51664\sigma_{17}^{176} - \\
& 8\sigma_{18}^{175} - 4\sigma_{19}^{174} - 4\sigma_{20}^{173} + 8\sigma_{54}^{139} + 16\sigma_{83}^{110} - 51664\sigma_{14}^{180} - 51664\sigma_{15}^{179} - 8\sigma_{18}^{176} - \\
& 4\sigma_{19}^{175} - 4\sigma_{20}^{174} + 8\sigma_{21}^{173} - 16\sigma_{83}^{111} - 51664\sigma_{14}^{181} - 8\sigma_{16}^{179} - 51664\sigma_{18}^{177} - 8\sigma_{19}^{176} - \\
& 4\sigma_{20}^{175} - 51664\sigma_{14}^{182} - 51664\sigma_{16}^{180} - 4\sigma_{17}^{179} - 8\sigma_{19}^{177} - 4\sigma_{20}^{176} + 8\sigma_{38}^{158} - 51664\sigma_{14}^{183} - \\
& 8\sigma_{17}^{180} - 4\sigma_{18}^{179} - 51664\sigma_{19}^{178} - 8\sigma_{20}^{177} - 51664\sigma_{17}^{181} - 4\sigma_{18}^{180} - 4\sigma_{19}^{179} - 8\sigma_{20}^{178} + 8\sigma_{39}^{159} - \\
& 51664\sigma_{15}^{184} - 8\sigma_{18}^{181} - 4\sigma_{19}^{180} - 4\sigma_{20}^{179} - 51664\sigma_{15}^{176} - 51664\sigma_{16}^{184} - 51664\sigma_{18}^{182} - 4\sigma_{19}^{181} - \\
& 4\sigma_{20}^{180} - 51664\sigma_{15}^{186} - 16\sigma_{17}^{184} - 8\sigma_{19}^{182} - 4\sigma_{20}^{181} - 51664\sigma_{15}^{187} - 51664\sigma_{17}^{176} - 16\sigma_{18}^{184} - \\
& 51664\sigma_{19}^{183} - 4\sigma_{20}^{182} - 51664\sigma_{15}^{188} - 24\sigma_{18}^{176} - 16\sigma_{19}^{184} - 8\sigma_{20}^{183} + 8\sigma_{54}^{149} - 51664\sigma_{18}^{186} - \\
& 8\sigma_{20}^{184} + 8\sigma_{38}^{166} - 51664\sigma_{16}^{189} - 16\sigma_{19}^{186} - 8\sigma_{20}^{176} + 8\sigma_{21}^{184} + 16\sigma_{83}^{122} - 51664\sigma_{16}^{190} - \\
& 51664\sigma_{17}^{189} - 51664\sigma_{19}^{187} - 8\sigma_{20}^{186} + 8\sigma_{39}^{167} - 16\sigma_{84}^{122} - 51664\sigma_{16}^{191} - 16\sigma_{18}^{189} - 16\sigma_{20}^{187} + \\
& 8\sigma_{22}^{176} - 51664\sigma_{16}^{192} - 51664\sigma_{18}^{190} - 24\sigma_{19}^{189} - 51664\sigma_{20}^{188} - 16\sigma_{19}^{190} - 8\sigma_{20}^{189} + 8\sigma_{23}^{186} - \\
& 51664\sigma_{17}^{193} - 51664\sigma_{19}^{191} - 8\sigma_{20}^{190} + 8\sigma_{21}^{189} - 51664\sigma_{17}^{194} - 51664\sigma_{18}^{193} - 16\sigma_{20}^{191} + 8\sigma_{38}^{173} - \\
& 51664\sigma_{17}^{195} - 16\sigma_{19}^{193} - 51664\sigma_{20}^{192} + 8\sigma_{22}^{190} + 8\sigma_{54}^{158} - 51664\sigma_{19}^{194} - 16\sigma_{20}^{193} - 51664\sigma_{18}^{196} - \\
& 16\sigma_{20}^{194} + 8\sigma_{21}^{193} + 8\sigma_{23}^{191} - 51664\sigma_{18}^{197} - 51664\sigma_{19}^{196} - 51664\sigma_{20}^{195} - 8\sigma_{20}^{196} + 8\sigma_{22}^{194} - \\
& 51664\sigma_{19}^{198} - 51664\sigma_{20}^{197} + 8\sigma_{21}^{196} - 51664\sigma_{20}^{198} + 8\sigma_{23}^{195} + 8\sigma_{21}^{198} + 8\sigma_{22}^{197} + 16\sigma_{97}^{122} + \\
& 8\sigma_{54}^{166} + 8\sigma_{38}^{184} + 8\sigma_{83}^{139} + 8\sigma_{39}^{176} + 8\sigma_{84}^{140} - 8\sigma_{83}^{142} - 8\sigma_{84}^{141} - 8\sigma_{85}^{140} - 8\sigma_{86}^{139} + 8\sigma_{85}^{141} + \\
& 8\sigma_{38}^{189} + 8\sigma_{54}^{173} + 8\sigma_{86}^{142} + 8\sigma_{39}^{190} + 8\sigma_{38}^{193} + 8\sigma_{83}^{149} + 8\sigma_{39}^{194} + 8\sigma_{38}^{196} + 8\sigma_{84}^{150} - 8\sigma_{83}^{152} - \\
& 8\sigma_{84}^{151} - 8\sigma_{85}^{150} - 8\sigma_{86}^{149} + 8\sigma_{38}^{198} + 8\sigma_{39}^{197} + 8\sigma_{85}^{151} + 8\sigma_{97}^{139} + 8\sigma_{54}^{184} + 8\sigma_{86}^{152} + 8\sigma_{98}^{140} + \\
& 8\sigma_{99}^{141} + 8\sigma_{83}^{158} + 8\sigma_{54}^{189} + 8\sigma_{84}^{159} - 8\sigma_{84}^{160} - 8\sigma_{85}^{159} - 8\sigma_{86}^{158} + 8\sigma_{85}^{160} + 8\sigma_{97}^{149} + 8\sigma_{54}^{193} + \\
& 8\sigma_{98}^{150} + 8\sigma_{83}^{166} + 8\sigma_{110}^{139} + 8\sigma_{54}^{196} + 8\sigma_{99}^{151} + 8\sigma_{84}^{167} + 8\sigma_{111}^{140} + 8\sigma_{54}^{198} - 8\sigma_{8$$

Complete Expression in the Extended Turyn Based Method

A complete expression of Eq.(??)

$$\begin{aligned}
 E_k(s) = & 4s_2 - 14s_0 - 14s_3 + 18s_4 - 4s_5 + 4s_6 - 18s_7 + 24s_8 + 24s_{11} + 40s_{12} - 8s_{13} + 16s_{14} - 40s_{15} - 16s_0s_1 + \\
 & 6s_0s_2 - 16s_1s_2 + 4s_0s_4 - 2s_1s_3 - 4s_0s_5 - 16s_2s_3 + 4s_0s_6 + 8s_1s_5 + 4s_2s_4 - 4s_0s_7 - 8s_1s_6 - 4s_2s_5 - 4s_3s_4 - 8s_0s_8 + \\
 & 4s_2s_6 + 8s_1s_8 - 4s_2s_7 - 20s_4s_5 - 8s_1s_9 + 4s_3s_7 + 6s_4s_6 - 8s_0s_{11} - 8s_1s_{10} - 8s_3s_8 - 8s_4s_7 - 28s_5s_6 + 4s_0s_{12} + 8s_1s_{11} + \\
 & 8s_3s_9 + 6s_5s_7 - 4s_0s_{13} + 8s_3s_{10} - 20s_6s_7 + 8s_0s_{14} + 12s_1s_{13} + 8s_2s_{12} - 8s_3s_{11} - 4s_0s_{15} - 8s_1s_{14} - 4s_2s_{13} - 4s_3s_{12} + \\
 & 4s_1s_{15} + 8s_2s_{14} + 4s_3s_{13} + 12s_4s_{12} - 4s_2s_{15} - 4s_4s_{13} - 8s_5s_{12} - 48s_8s_9 + 4s_3s_{15} + 8s_4s_{14} + 20s_5s_{13} + 8s_6s_{12} - 8s_8s_{10} - \\
 & 12s_4s_{15} - 16s_5s_{14} - 20s_6s_{13} - 12s_7s_{12} + 32s_8s_{11} - 16s_9s_{10} + 4s_5s_{15} + 16s_6s_{14} + 4s_7s_{13} + 8s_8s_{12} - 8s_9s_{11} - 4s_6s_{15} - \\
 & 8s_7s_{14} - 8s_8s_{13} - 48s_{10}s_{11} + 12s_7s_{15} + 8s_9s_{13} + 8s_8s_{15} + 8s_{10}s_{13} + 8s_{11}s_{12} - 8s_9s_{15} - 8s_{11}s_{13} - 8s_{10}s_{15} - 40s_{12}s_{13} + \\
 & 8s_{11}s_{15} + 24s_{12}s_{14} - 16s_{12}s_{15} - 56s_{13}s_{14} + 8s_{13}s_{15} - 40s_{14}s_{15} + 4s_0s_1s_2 + 8s_0s_1s_3 - 2s_0s_1s_4 + 2s_0s_2s_4 + 4s_1s_2s_3 - \\
 & 2s_0s_2s_5 - 2s_1s_2s_4 + 2s_0s_1s_7 + 2s_0s_2s_6 + 4s_0s_3s_5 + 2s_1s_3s_4 - 4s_0s_1s_8 - 2s_0s_2s_7 - 4s_0s_3s_6 + 2s_0s_4s_5 - 2s_1s_3s_5 - \\
 & 2s_2s_3s_4 + 4s_0s_2s_8 + 2s_0s_4s_6 + 2s_1s_2s_7 + 2s_1s_3s_6 - 4s_0s_2s_9 + 2s_0s_5s_6 - 4s_1s_2s_8 - 2s_1s_3s_7 + 2s_1s_4s_6 - 4s_0s_1s_{11} - \\
 & 4s_0s_2s_{10} + 2s_0s_5s_7 + 4s_1s_3s_8 + 4s_1s_4s_7 + 2s_2s_3s_7 + 2s_2s_4s_6 + 2s_3s_4s_5 - 4s_0s_1s_{12} + 4s_0s_2s_{11} + 2s_0s_6s_7 - 4s_1s_3s_9 + \\
 & 2s_1s_5s_7 - 4s_2s_3s_8 - 2s_3s_4s_6 + 4s_0s_2s_{12} - 4s_1s_2s_{11} - 4s_1s_3s_{10} + 2s_2s_5s_7 + 2s_3s_5s_6 - 4s_0s_2s_{13} - 4s_1s_2s_{12} + 4s_1s_3s_{11} - \\
 & 2s_3s_5s_7 - 4s_4s_5s_6 + 4s_0s_1s_{15} + 4s_0s_2s_{14} + 8s_0s_3s_{13} + 4s_1s_3s_{12} - 4s_2s_3s_{11} + 2s_3s_6s_7 + 8s_4s_5s_7 - 4s_0s_3s_{14} + 4s_0s_8s_9 - \\
 & 4s_1s_3s_{13} - 4s_2s_3s_{12} - 4s_4s_5s_8 - 8s_4s_6s_7 + 4s_0s_8s_{10} + 4s_1s_2s_{15} + 4s_1s_3s_{14} + 4s_4s_6s_8 + 4s_5s_6s_7 + 4s_0s_9s_{10} + 4s_1s_8s_{10} - \\
 & 4s_4s_6s_9 - 4s_5s_6s_8 + 4s_0s_9s_{11} + 8s_1s_8s_{11} + 4s_2s_3s_{15} + 4s_2s_8s_{10} + 4s_3s_8s_9 - 4s_4s_5s_{11} - 4s_4s_6s_{10} + 4s_5s_7s_8 + 4s_0s_{10}s_{11} + \\
 & 4s_1s_9s_{11} - 4s_3s_8s_{10} - 4s_4s_5s_{12} + 4s_4s_6s_{11} - 4s_4s_8s_9 - 4s_5s_7s_9 - 4s_6s_7s_8 + 4s_2s_9s_{11} + 4s_3s_9s_{10} + 4s_4s_6s_{12} + \\
 & 4s_4s_8s_{10} - 4s_5s_6s_{11} - 4s_5s_7s_{10} - 4s_3s_9s_{11} - 4s_4s_6s_{13} - 4s_4s_9s_{10} - 4s_5s_6s_{12} + 4s_5s_7s_{11} - 4s_5s_8s_{10} + 4s_3s_{10}s_{11} + \\
 & 4s_4s_5s_{15} + 4s_4s_6s_{14} + 8s_4s_7s_{13} + 4s_4s_9s_{11} + 4s_5s_7s_{12} + 8s_5s_8s_{11} - 4s_6s_7s_{11} + 4s_6s_8s_{10} + 4s_7s_8s_9 + 4s_0s_{12}s_{13} - \\
 & 4s_4s_7s_{14} - 4s_4s_{10}s_{11} - 4s_5s_7s_{13} - 4s_5s_9s_{11} - 4s_6s_7s_{12} - 8s_6s_8s_{11} - 4s_7s_8s_{10} + 4s_0s_{12}s_{14} + 4s_5s_6s_{15} + 4s_5s_7s_{14} + \\
 & 4s_6s_9s_{11} + 4s_7s_9s_{10} + 4s_0s_{13}s_{14} + 4s_1s_{12}s_{14} - 4s_7s_9s_{11} - 16s_8s_9s_{10} + 4s_0s_{13}s_{15} + 8s_1s_{12}s_{15} + 4s_2s_{12}s_{14} + 4s_3s_{12}s_{13} + \\
 & 4s_6s_7s_{15} + 4s_7s_{10}s_{11} + 4s_0s_{14}s_{15} + 4s_1s_{13}s_{15} - 4s_3s_{12}s_{14} - 4s_4s_{12}s_{13} - 8s_8s_9s_{12} + 4s_2s_{13}s_{15} + 4s_3s_{13}s_{14} + 4s_4s_{12}s_{14} + \\
 & 8s_8s_{10}s_{12} - 16s_9s_{10}s_{11} - 4s_3s_{13}s_{15} - 4s_4s_{13}s_{14} - 4s_5s_{12}s_{14} - 8s_8s_{10}s_{13} - 8s_9s_{10}s_{12} + 4s_3s_{14}s_{15} + 4s_4s_{13}s_{15} + \\
 & 8s_5s_{12}s_{15} + 4s_6s_{12}s_{14} + 4s_7s_{12}s_{13} + 8s_8s_9s_{15} + 8s_8s_{10}s_{14} + 16s_8s_{11}s_{13} + 8s_9s_{11}s_{12} - 4s_4s_{14}s_{15} - 4s_5s_{13}s_{15} - \\
 & 8s_6s_{12}s_{15} - 4s_7s_{12}s_{14} - 8s_8s_{11}s_{14} - 8s_8s_{12}s_{13} - 8s_9s_{11}s_{13} - 8s_{10}s_{11}s_{12} + 4s_6s_{13}s_{15} + 4s_7s_{13}s_{14} + 8s_8s_{12}s_{14} + \\
 & 8s_9s_{10}s_{15} + 8s_9s_{11}s_{14} - 4s_7s_{13}s_{15} - 8s_8s_{13}s_{14} - 8s_9s_{12}s_{14} + 4s_7s_{14}s_{15} + 8s_8s_{13}s_{15} + 8s_{10}s_{11}s_{15} - 8s_{10}s_{12}s_{14} - \\
 & 8s_{11}s_{12}s_{13} - 8s_8s_{14}s_{15} - 8s_9s_{13}s_{15} + 8s_{11}s_{12}s_{14} - 8s_{10}s_{13}s_{15} - 8s_{11}s_{13}s_{14} + 8s_{11}s_{13}s_{15} - 16s_{12}s_{13}s_{14} - 8s_{11}s_{14}s_{15} + \\
 & 32s_{12}s_{13}s_{15} - 16s_{12}s_{14}s_{15} + 16s_{13}s_{14}s_{15} + 4s_0s_1s_2s_3 + 2s_0s_1s_4s_5 + 2s_0s_1s_5s_6 + 2s_0s_2s_4s_6 + 2s_1s_2s_4s_5 + 2s_0s_1s_6s_7 + \\
 & 2s_0s_2s_5s_7 + 2s_0s_3s_4s_7 + 2s_1s_2s_5s_6 + 2s_1s_3s_4s_6 + 2s_2s_3s_4s_5 + 2s_1s_2s_6s_7 + 2s_1s_3s_5s_7 + 2s_2s_3s_5s_6 + 4s_0s_1s_8s_9 + \\
 & 2s_2s_3s_6s_7 + 4s_0s_1s_9s_{10} + 4s_0s_2s_8s_{10} + 4s_1s_2s_8s_9 + 4s_0s_1s_{10}s_{11} + 4s_0s_2s_9s_{11} + 4s_0s_3s_8s_{11} + 4s_1s_2s_9s_{10} + 4s_1s_3s_8s_{10} + \\
 & 4s_2s_3s_8s_9 + 4s_4s_5s_6s_7 + 4s_1s_2s_{10}s_{11} + 4s_1s_3s_9s_{11} + 4s_2s_3s_9s_{10} + 4s_0s_1s_{12}s_{13} + 4s_2s_3s_{10}s_{11} + 4s_4s_5s_8s_9 + 4s_0s_1s_{13}s_{14} + \\
 & 4s_0s_2s_{12}s_{14} + 4s_1s_2s_{12}s_{13} + 4s_4s_5s_9s_{10} + 4s_4s_6s_8s_{10} + 4s_5s_6s_8s_9 + 4s_0s_1s_{14}s_{15} + 4s_0s_2s_{13}s_{15} + 4s_0s_3s_{12}s_{15} + \\
 & 4s_1s_2s_{13}s_{14} + 4s_1s_3s_{12}s_{14} + 4s_2s_3s_{12}s_{13} + 4s_4s_5s_{10}s_{11} + 4s_4s_6s_9s_{11} + 4s_4s_7s_8s_{11} + 4s_5s_6s_9s_{10} + 4s_5s_7s_8s_{10} + \\
 & 4s_6s_7s_8s_9 + 4s_1s_2s_{14}s_{15} + 4s_1s_3s_{13}s_{15} + 4s_2s_3s_{13}s_{14} + 4s_5s_6s_{10}s_{11} + 4s_5s_7s_9s_{11} + 4s_6s_7s_9s_{10} + 4s_2s_3s_{14}s_{15} + \\
 & 4s_4s_5s_{12}s_{13} + 4s_6s_7s_{10}s_{11} + 4s_4s_5s_{13}s_{14} + 4s_4s_6s_{12}s_{14} + 4s_5s_6s_{12}s_{13} + 4s_4s_5s_{14}s_{15} + 4s_4s_6s_{13}s_{15} + 4s_4s_7s_{12}s_{15} + \\
 & 4s_5s_6s_{13}s_{14} + 4s_5s_7s_{12}s_{14} + 4s_6s_7s_{12}s_{13} + 16s_8s_9s_{10}s_{11} + 4s_5s_6s_{14}s_{15} + 4s_5s_7s_{13}s_{15} + 4s_6s_7s_{13}s_{14} + 4s_6s_7s_{14}s_{15} + \\
 & 8s_8s_9s_{12}s_{13} + 8s_8s_9s_{13}s_{14} + 8s_8s_{10}s_{12}s_{14} + 8s_9s_{10}s_{12}s_{13} + 8s_8s_9s_{14}s_{15} + 8s_8s_{10}s_{13}s_{15} + 8s_8s_{11}s_{12}s_{15} + 8s_9s_{10}s_{13}s_{14} + \\
 & 8s_9s_{11}s_{12}s_{14} + 8s_{10}s_{11}s_{12}s_{13} + 8s_9s_{10}s_{14}s_{15} + 8s_9s_{11}s_{13}s_{15} + 8s_{10}s_{11}s_{13}s_{14} + 8s_{10}s_{11}s_{14}s_{15} + 16s_{12}s_{13}s_{14}s_{15} + 264
 \end{aligned}$$

A complete expression of $E_k(q)$ in 92-order H matrix using extended Turyn based method.

$$\begin{aligned}
 E_k(q) = & 88q_0q_1 - 204q_1 - 172q_2 - 116q_3 - 132q_4 - 92q_5 - 76q_6 - 84q_7 - 240q_8 - 80q_9 - 80q_{10} - 240q_{11} - \\
 & 272q_{12} - 160q_{13} - 176q_{14} - 224q_{15} - 180q_0 + 152q_0q_2 + 104q_0q_3 + 72q_1q_2 + 56q_0q_4 + 152q_1q_3 + 40q_0q_5 + \\
 & 40q_1q_4 + 56q_2q_3 + 56q_0q_6 + 72q_1q_5 + 40q_2q_4 + 24q_0q_7 + 24q_1q_6 + 24q_2q_5 + 8q_3q_4 + 48q_0q_8 + 56q_1q_7 + 72q_2q_6 + \\
 & 40q_3q_5 + 80q_0q_9 + 112q_1q_8 + 24q_2q_7 + 24q_3q_6 + 56q_4q_5 + 80q_0q_{10} + 48q_1q_9 + 48q_2q_8 + 40q_3q_7 + 104q_4q_6 + \\
 & 48q_0q_{11} + 48q_1q_{10} + 80q_2q_9 + 16q_3q_8 + 56q_4q_7 + 8q_5q_6 + 96q_0q_{12} + 112q_1q_{11} + 80q_2q_{10} + 80q_3q_9 + 48q_4q_8 +
 \end{aligned}$$

$$\begin{aligned}
& 200q_5q_7+96q_0q_{13}+80q_1q_{12}+48q_2q_{11}+80q_3q_{10}+16q_4q_9+48q_5q_8+24q_6q_7+128q_0q_{14}+128q_1q_{13}+80q_2q_{12}+ \\
& 16q_3q_{11}+16q_4q_{10}+48q_5q_9+16q_6q_8+80q_0q_{15}+80q_1q_{14}+64q_2q_{13}+32q_3q_{12}+48q_4q_{11}+48q_5q_{10}+80q_6q_9+ \\
& 48q_7q_8+144q_1q_{15}+144q_2q_{14}+96q_3q_{13}+96q_4q_{12}+48q_5q_{11}+80q_6q_{10}+48q_7q_9+80q_2q_{15}+64q_3q_{14}+ \\
& 32q_4q_{13}+16q_5q_{12}+16q_6q_{11}+48q_7q_{10}+32q_8q_9+80q_3q_{15}+64q_4q_{14}+128q_5q_{13}+48q_6q_{12}+48q_7q_{11}+ \\
& 160q_8q_{10}+16q_4q_{15}+16q_5q_{14}+320q_8q_{11}+96q_9q_{10}+112q_5q_{15}+176q_6q_{14}+96q_7q_{13}+128q_8q_{12}+160q_9q_{11}+ \\
& 48q_6q_{15}+32q_7q_{14}+64q_8q_{13}+32q_9q_{12}+32q_{10}q_{11}+112q_7q_{15}+64q_8q_{14}+128q_9q_{13}+32q_{10}q_{12}+160q_8q_{15}+ \\
& 160q_9q_{14}+128q_{10}q_{13}+128q_{11}q_{12}+96q_9q_{15}+160q_{10}q_{14}+64q_{11}q_{13}+96q_{10}q_{15}+64q_{11}q_{14}+128q_{12}q_{13}+ \\
& 160q_{11}q_{15}+192q_{12}q_{14}+160q_{12}q_{15}+448q_{13}q_{15}+64q_{14}q_{15}-64q_0q_1q_2-96q_0q_1q_3-32q_0q_2q_3-32q_0q_1q_5- \\
& 32q_0q_2q_4-64q_1q_2q_3-32q_0q_1q_6-16q_0q_3q_4-32q_0q_1q_7-32q_0q_2q_6-32q_0q_3q_5-32q_1q_2q_5-32q_1q_3q_4+ \\
& 32q_0q_3q_6-32q_0q_4q_5-32q_1q_2q_6-64q_0q_1q_9-64q_0q_2q_8-16q_0q_3q_7-32q_0q_4q_6-32q_1q_2q_7-32q_1q_3q_6- \\
& 32q_1q_4q_5-32q_2q_3q_5-64q_0q_1q_{10}-32q_0q_3q_8-16q_0q_4q_7-32q_0q_5q_6-32q_1q_4q_6-32q_2q_3q_6-32q_2q_4q_5- \\
& 32q_0q_5q_7-64q_1q_2q_9-64q_1q_3q_8-32q_1q_4q_7-32q_1q_5q_6-32q_2q_3q_7-32q_2q_4q_6-32q_3q_4q_5-64q_0q_2q_{11}- \\
& 32q_0q_6q_7-64q_1q_2q_{10}-32q_1q_5q_7-32q_2q_5q_6-64q_0q_1q_{13}-64q_0q_2q_{12}-32q_0q_3q_{11}-32q_1q_6q_7-64q_2q_3q_9- \\
& 32q_2q_5q_7-16q_3q_4q_7-32q_3q_5q_6-64q_0q_1q_{14}-32q_0q_3q_{12}-64q_1q_3q_{11}-64q_2q_3q_{10}-32q_2q_6q_7-64q_0q_1q_{15}- \\
& 64q_0q_2q_{14}-64q_0q_3q_{13}-64q_1q_2q_{13}-64q_1q_3q_{12}-32q_3q_6q_7-96q_4q_5q_7-32q_0q_2q_{15}+32q_0q_3q_{14}- \\
& 64q_0q_8q_9-64q_1q_2q_{14}+32q_4q_6q_7-32q_0q_3q_{15}-64q_0q_8q_{10}-64q_1q_2q_{15}-64q_1q_3q_{14}-64q_1q_8q_9-64q_2q_3q_{13}- \\
& 64q_4q_5q_9-64q_4q_6q_8-64q_5q_6q_7-32q_0q_8q_{11}-64q_0q_9q_{10}-32q_1q_3q_{15}-64q_1q_8q_{10}-64q_2q_3q_{14}-64q_2q_8q_9- \\
& 64q_4q_5q_{10}-32q_4q_7q_8-64q_0q_9q_{11}-64q_1q_8q_{11}-64q_1q_9q_{10}-64q_2q_3q_{15}-64q_2q_8q_{10}-64q_3q_8q_9- \\
& 64q_5q_6q_9-64q_5q_7q_8-64q_0q_{10}q_{11}-64q_1q_9q_{11}-64q_2q_9q_{10}-64q_4q_6q_{11}-64q_5q_6q_{10}-64q_1q_{10}q_{11}- \\
& 64q_2q_9q_{11}-32q_3q_8q_{11}-64q_3q_9q_{10}-64q_4q_5q_{13}-64q_4q_6q_{12}-32q_4q_7q_{11}-64q_4q_8q_{10}-64q_5q_8q_9- \\
& 64q_6q_7q_9-64q_2q_{10}q_{11}-64q_4q_5q_{14}-32q_4q_7q_{12}-32q_4q_8q_{11}-64q_5q_7q_{11}-64q_6q_7q_{10}-64q_6q_8q_9- \\
& 64q_3q_{10}q_{11}-64q_4q_5q_{15}-64q_4q_6q_{14}-64q_4q_7q_{13}-64q_4q_9q_{11}-64q_5q_6q_{13}-64q_5q_7q_{12}-64q_5q_8q_{11}- \\
& 64q_5q_9q_{10}-64q_6q_8q_{10}-64q_7q_8q_9-64q_0q_{12}q_{13}-32q_4q_6q_{15}+32q_4q_7q_{14}-64q_5q_6q_{14}+64q_6q_8q_{11}- \\
& 64q_6q_9q_{10}-64q_0q_{12}q_{14}-64q_1q_{12}q_{13}-32q_4q_7q_{15}-64q_5q_6q_{15}-64q_5q_7q_{14}-64q_5q_{10}q_{11}-64q_6q_7q_{13}- \\
& 64q_6q_9q_{11}-32q_7q_8q_{11}-64q_7q_9q_{10}-32q_0q_{12}q_{15}-64q_0q_{13}q_{14}-64q_1q_{12}q_{14}-64q_2q_{12}q_{13}-32q_5q_7q_{15}- \\
& 64q_6q_7q_{14}-64q_6q_{10}q_{11}-64q_0q_{13}q_{15}-64q_1q_{12}q_{15}-64q_1q_{13}q_{14}-64q_2q_{12}q_{14}-64q_3q_{12}q_{13}-64q_6q_7q_{15}- \\
& 64q_7q_{10}q_{11}-128q_8q_9q_{11}-64q_0q_{14}q_{15}-64q_1q_{13}q_{15}-64q_2q_{13}q_{14}-128q_8q_{10}q_{11}-64q_1q_{14}q_{15}-64q_2q_{13}q_{15}- \\
& 32q_3q_{12}q_{15}-64q_3q_{13}q_{14}-64q_4q_{12}q_{14}-64q_5q_{12}q_{13}-128q_8q_9q_{13}-128q_8q_{10}q_{12}-64q_2q_{14}q_{15}-32q_4q_{12}q_{15}- \\
& 64q_6q_{12}q_{13}-128q_8q_9q_{14}-64q_8q_{11}q_{12}-64q_3q_{14}q_{15}-64q_4q_{13}q_{15}-64q_5q_{12}q_{15}-64q_5q_{13}q_{14}-64q_6q_{12}q_{14}- \\
& 64q_7q_{12}q_{13}-128q_8q_9q_{15}-128q_8q_{10}q_{14}-128q_8q_{11}q_{13}-128q_9q_{10}q_{13}-128q_9q_{11}q_{12}+64q_6q_{12}q_{15}- \\
& 64q_6q_{13}q_{14}-64q_8q_{10}q_{15}+64q_8q_{11}q_{14}-128q_9q_{10}q_{14}-64q_5q_{14}q_{15}-64q_6q_{13}q_{15}-32q_7q_{12}q_{15}-64q_7q_{13}q_{14}- \\
& 64q_8q_{11}q_{15}-128q_8q_{12}q_{14}-128q_9q_{10}q_{15}-128q_9q_{11}q_{14}-128q_9q_{12}q_{13}-128q_{10}q_{11}q_{13}-64q_6q_{14}q_{15}- \\
& 64q_8q_{12}q_{15}-64q_9q_{11}q_{15}-128q_{10}q_{11}q_{14}-128q_{10}q_{12}q_{13}-64q_7q_{14}q_{15}-128q_8q_{13}q_{15}-128q_9q_{13}q_{14}- \\
& 128q_{10}q_{11}q_{15}-128q_{10}q_{13}q_{14}-128q_{11}q_{12}q_{14}-128q_9q_{14}q_{15}-64q_{11}q_{12}q_{15}-128q_{10}q_{14}q_{15}-128q_{11}q_{13}q_{15}- \\
& 384q_{12}q_{13}q_{15}-256q_{13}q_{14}q_{15}+64q_0q_1q_2q_3+32q_0q_1q_4q_5+32q_0q_1q_5q_6+32q_0q_2q_4q_6+32q_1q_2q_4q_5+ \\
& 32q_0q_1q_6q_7+32q_0q_2q_5q_7+32q_0q_3q_4q_7+32q_1q_2q_5q_6+32q_1q_3q_4q_6+32q_2q_3q_4q_5+32q_1q_2q_6q_7+ \\
& 32q_1q_3q_5q_7+32q_2q_3q_5q_6+64q_0q_1q_8q_9+32q_2q_3q_6q_7+64q_0q_1q_9q_{10}+64q_0q_2q_8q_{10}+64q_1q_2q_8q_9+ \\
& 64q_0q_1q_{10}q_{11}+64q_0q_2q_9q_{11}+64q_0q_3q_8q_{11}+64q_1q_2q_9q_{10}+64q_1q_3q_8q_{10}+64q_2q_3q_8q_9+64q_4q_5q_6q_7+ \\
& 64q_1q_2q_{10}q_{11}+64q_1q_3q_9q_{11}+64q_2q_3q_9q_{10}+64q_0q_1q_{12}q_{13}+64q_2q_3q_{10}q_{11}+64q_4q_5q_8q_9+64q_0q_1q_{13}q_{14}+ \\
& 64q_0q_2q_{12}q_{14}+64q_1q_2q_{12}q_{13}+64q_4q_5q_9q_{10}+64q_4q_6q_8q_{10}+64q_5q_6q_8q_9+64q_0q_1q_{14}q_{15}+64q_0q_2q_{13}q_{15}+ \\
& 64q_0q_3q_{12}q_{15}+64q_1q_2q_{13}q_{14}+64q_1q_3q_{12}q_{14}+64q_2q_3q_{12}q_{13}+64q_4q_5q_{10}q_{11}+64q_4q_6q_9q_{11}+64q_4q_7q_8q_{11}+ \\
& 64q_5q_6q_9q_{10}+64q_5q_7q_8q_{10}+64q_6q_7q_8q_9+64q_1q_2q_{14}q_{15}+64q_1q_3q_{13}q_{15}+64q_2q_3q_{13}q_{14}+64q_5q_6q_{10}q_{11}+ \\
& 64q_5q_7q_9q_{11}+64q_6q_7q_9q_{10}+64q_2q_3q_{14}q_{15}+64q_4q_5q_{12}q_{13}+64q_6q_7q_{10}q_{11}+64q_4q_5q_{13}q_{14}+64q_4q_6q_{12}q_{14}+ \\
& 64q_5q_6q_{12}q_{13}+64q_4q_5q_{14}q_{15}+64q_4q_6q_{13}q_{15}+64q_4q_7q_{12}q_{15}+64q_5q_6q_{13}q_{14}+64q_5q_7q_{12}q_{14}+64q_6q_7q_{12}q_{13}+ \\
& 256q_8q_9q_{10}q_{11}+64q_5q_6q_{14}q_{15}+64q_5q_7q_{13}q_{15}+64q_6q_7q_{13}q_{14}+64q_6q_7q_{14}q_{15}+128q_8q_9q_{12}q_{13}+128q_8q_9q_{13}q_{14}+ \\
& 128q_8q_{10}q_{12}q_{14}+128q_9q_{10}q_{12}q_{13}+128q_8q_9q_{14}q_{15}+128q_8q_{10}q_{13}q_{15}+128q_8q_{11}q_{12}q_{15}+128q_9q_{10}q_{13}q_{14}+ \\
& 128q_9q_{11}q_{12}q_{14}+128q_{10}q_{11}q_{12}q_{13}+128q_9q_{10}q_{14}q_{15}+128q_9q_{11}q_{13}q_{15}+128q_{10}q_{11}q_{13}q_{14}+128q_{10}q_{11}q_{14}q_{15}+ \\
& 256q_{12}q_{13}q_{14}q_{15}+472
\end{aligned}$$

A complete expression of $E_2(q)$ in 92-order H matrix using extended Turyn based method, using $\delta = 65, 936$

$$\begin{aligned}
 E_2(q) = & 197896q_{16} - 204q_1 - 172q_2 - 116q_3 - 132q_4 - 92q_5 - 76q_6 - 84q_7 - 240q_8 - 80q_9 - 80q_{10} - 240q_{11} - \\
 & 272q_{12} - 160q_{13} - 176q_{14} - 224q_{15} - 180q_0 + 197960q_{17} + 197912q_{18} + 197864q_{19} + 197848q_{20} + 197864q_{21} + \\
 & 197856q_{22} + 197888q_{23} + 197888q_{24} + 197904q_{25} + 197904q_{26} + 197936q_{27} + 197880q_{28} + 197960q_{29} + \\
 & 197848q_{30} + 197880q_{31} + 197832q_{32} + 197920q_{33} + 197856q_{34} + 197856q_{35} + 197888q_{36} + 197936q_{37} + \\
 & 197888q_{38} + 197864q_{39} + 197848q_{40} + 197832q_{41} + 197880q_{42} + 197856q_{43} + 197888q_{44} + 197888q_{45} + \\
 & 197888q_{46} + 197872q_{47} + 197952q_{48} + 197816q_{49} + 197848q_{50} + 197832q_{51} + 197824q_{52} + 197888q_{53} + \\
 & 197888q_{54} + 197840q_{55} + 197904q_{56} + 197872q_{57} + 197864q_{58} + 197912q_{59} + 197864q_{60} + 197856q_{61} + \\
 & 197824q_{62} + 197904q_{63} + 197840q_{64} + 197816q_{65} + 198008q_{66} + 197856q_{67} + 197856q_{68} + 197856q_{69} + \\
 & 197824q_{70} + 197936q_{71} + 197824q_{72} + 197832q_{73} + 197824q_{74} + 197888q_{75} + 197888q_{76} + 197856q_{77} + \\
 & 197808q_{78} + 197984q_{79} + 197856q_{80} + 197856q_{81} + 197856q_{82} + 197808q_{83} + 197904q_{84} + 197840q_{85} + \\
 & 197840q_{86} + 197968q_{87} + 198128q_{88} + 197936q_{89} + 197872q_{90} + 197904q_{91} + 197968q_{92} + 197840q_{93} + \\
 & 197936q_{94} + 197968q_{95} + 197840q_{96} + 197840q_{97} + 197936q_{98} + 197968q_{99} + 197936q_{100} + 197872q_{101} + \\
 & 197936q_{102} + 198000q_{103} + 197968q_{104} + 197808q_{105} + 198256q_{106} + 197872q_{107} + 65936q_0q_1 + 65936q_0q_2 + \\
 & 65936q_0q_3 + 65936q_1q_2 + 65936q_0q_4 + 65936q_1q_3 + 65936q_0q_5 + 65936q_1q_4 + 65936q_2q_3 + 65936q_0q_6 + \\
 & 65936q_1q_5 + 65936q_2q_4 + 24q_0q_7 + 65936q_1q_6 + 65936q_2q_5 + 65936q_3q_4 + 65936q_0q_8 + 56q_1q_7 + 65936q_2q_6 + \\
 & 65936q_3q_5 + 65936q_0q_9 + 65936q_1q_8 + 24q_2q_7 + 65936q_3q_6 + 65936q_4q_5 + 65936q_0q_{10} + 65936q_1q_9 + \\
 & 65936q_2q_8 + 40q_3q_7 + 65936q_4q_6 + 48q_0q_{11} + 65936q_1q_{10} + 65936q_2q_9 + 65936q_3q_8 + 65936q_4q_7 + 65936q_5q_6 + \\
 & 65936q_0q_{12} + 112q_1q_{11} + 65936q_2q_{10} + 65936q_3q_9 + 65936q_4q_8 + 65936q_5q_7 + 65936q_0q_{13} + 65936q_1q_{12} + \\
 & 48q_2q_{11} + 65936q_3q_{10} + 65936q_4q_9 + 65936q_5q_8 + 65936q_6q_7 + 65936q_0q_{14} + 65936q_1q_{13} + 65936q_2q_{12} + \\
 & 16q_3q_{11} + 16q_4q_{10} + 65936q_5q_9 + 65936q_6q_8 + 80q_0q_{15} + 65936q_1q_{14} + 65936q_2q_{13} + 65936q_3q_{12} + 48q_4q_{11} + \\
 & 65936q_5q_{10} + 65936q_6q_9 + 65936q_7q_8 - 131872q_0q_{16} + 144q_1q_{15} + 65936q_2q_{14} + 65936q_3q_{13} + 65936q_4q_{12} + \\
 & 48q_5q_{11} + 65936q_6q_{10} + 65936q_7q_9 - 131872q_0q_{17} - 131872q_1q_{16} + 80q_2q_{15} + 65936q_3q_{14} + 65936q_4q_{13} + \\
 & 65936q_5q_{12} + 16q_6q_{11} + 65936q_7q_{10} + 65936q_8q_9 - 131872q_0q_{18} - 64q_2q_{16} + 80q_3q_{15} + 64q_4q_{14} + 65936q_5q_{13} + \\
 & 65936q_6q_{12} + 48q_7q_{11} + 65936q_8q_{10} - 131872q_0q_{19} - 131872q_2q_{17} - 96q_3q_{16} + 16q_4q_{15} + 65936q_5q_{14} + \\
 & 65936q_6q_{13} + 65936q_7q_{12} + 65936q_8q_{11} + 65936q_9q_{10} - 131872q_0q_{20} - 32q_3q_{17} + 112q_5q_{15} + 65936q_6q_{14} + \\
 & 65936q_7q_{13} + 65936q_8q_{12} + 65936q_9q_{11} - 131872q_0q_{21} - 131872q_3q_{18} - 32q_4q_{17} - 32q_5q_{16} + 48q_6q_{15} + \\
 & 65936q_7q_{14} + 65936q_8q_{13} + 65936q_9q_{12} + 65936q_{10}q_{11} - 131872q_0q_{22} - 16q_4q_{18} - 32q_6q_{16} + 112q_7q_{15} + \\
 & 64q_8q_{14} + 65936q_9q_{13} + 65936q_{10}q_{12} - 131872q_0q_{23} - 131872q_4q_{19} - 32q_5q_{18} - 32q_6q_{17} - 32q_7q_{16} + \\
 & 160q_8q_{15} + 65936q_9q_{14} + 65936q_{10}q_{13} + 65936q_{11}q_{12} - 131872q_0q_{24} - 32q_5q_{19} + 32q_6q_{18} + 96q_9q_{15} + \\
 & 65936q_{10}q_{14} + 65936q_{11}q_{13} - 131872q_0q_{25} - 131872q_5q_{20} - 32q_6q_{19} - 16q_7q_{18} - 64q_8q_{17} - 64q_9q_{16} + \\
 & 96q_{10}q_{15} + 64q_{11}q_{14} + 65936q_{12}q_{13} - 131872q_0q_{26} - 32q_6q_{20} - 16q_7q_{19} - 32q_8q_{18} - 64q_{10}q_{16} + 160q_{11}q_{15} + \\
 & 65936q_{12}q_{14} - 131872q_0q_{27} - 131872q_6q_{21} - 32q_7q_{20} + 65936q_{12}q_{15} + 65936q_{13}q_{14} - 32q_7q_{21} - 64q_{11}q_{17} + \\
 & 65936q_{13}q_{15} - 131872q_1q_{28} - 32q_{11}q_{18} - 64q_{12}q_{17} - 64q_{13}q_{16} + 65936q_{14}q_{15} - 131872q_1q_{29} - 131872q_2q_{28} - \\
 & 131872q_8q_{22} - 32q_{12}q_{18} - 64q_{14}q_{16} - 131872q_1q_{30} - 64q_3q_{28} - 64q_9q_{22} - 64q_{13}q_{18} - 64q_{14}q_{17} - 64q_{15}q_{16} - \\
 & 131872q_1q_{31} - 131872q_3q_{29} - 131872q_9q_{23} - 64q_{10}q_{22} + 32q_{14}q_{18} - 32q_{15}q_{17} - 131872q_1q_{32} - 32q_4q_{29} - \\
 & 32q_5q_{28} - 64q_{10}q_{23} - 32q_{11}q_{22} - 32q_{15}q_{18} - 131872q_1q_{33} - 131872q_4q_{30} - 32q_6q_{28} - 131872q_{10}q_{24} - \\
 & 64q_{11}q_{23} - 131872q_1q_{34} - 32q_5q_{30} - 32q_6q_{29} - 32q_7q_{28} - 64q_{11}q_{24} - 131872q_1q_{35} - 131872q_5q_{31} - 32q_6q_{30} - \\
 & 131872q_1q_{36} - 32q_6q_{31} - 32q_7q_{30} - 64q_8q_{29} - 64q_9q_{28} - 131872q_{12}q_{25} - 131872q_1q_{37} - 131872q_6q_{32} - \\
 & 32q_7q_{31} - 64q_{10}q_{28} - 64q_{13}q_{25} - 131872q_1q_{38} - 32q_7q_{32} - 131872q_{13}q_{26} - 64q_{14}q_{25} - 64q_{11}q_{29} - 64q_{14}q_{26} - \\
 & 32q_{15}q_{25} - 131872q_2q_{39} - 131872q_8q_{33} - 64q_{12}q_{29} - 64q_{13}q_{28} - 131872q_{14}q_{27} - 64q_{15}q_{26} - 131872q_2q_{40} - \\
 & 131872q_3q_{39} - 64q_9q_{33} - 64q_{14}q_{28} - 64q_{15}q_{27} - 131872q_2q_{41} - 131872q_9q_{34} - 64q_{10}q_{33} - 64q_{14}q_{29} - \\
 & 64q_{15}q_{28} - 131872q_2q_{42} - 131872q_4q_{40} - 32q_5q_{39} - 64q_{10}q_{34} - 64q_{11}q_{33} - 32q_{15}q_{29} - 131872q_2q_{43} - \\
 & 32q_5q_{40} - 32q_6q_{39} - 131872q_{10}q_{35} - 64q_{11}q_{34} - 131872q_2q_{44} - 131872q_5q_{41} - 32q_6q_{40} - 32q_7q_{39} - \\
 & 64q_{11}q_{35} - 131872q_2q_{45} - 32q_6q_{41} - 131872q_2q_{46} - 131872q_6q_{42} - 32q_7q_{41} - 64q_9q_{39} - 131872q_{12}q_{36} - \\
 & 131872q_2q_{47} - 32q_7q_{42} - 64q_{10}q_{39} - 64q_{13}q_{36} - 131872q_2q_{48} - 131872q_{13}q_{37} - 64q_{14}q_{36} - 131872q_8q_{43} -
 \end{aligned}$$

$$\begin{aligned}
& 64q_{14}q_{37} - 64q_{15}q_{36} - 131872q_3q_{49} - 64q_9q_{43} - 64q_{13}q_{39} - 131872q_{14}q_{38} - 64q_{15}q_{37} - 131872q_3q_{50} - \\
& 131872q_4q_{49} - 131872q_9q_{44} - 64q_{10}q_{43} - 64q_{14}q_{39} - 64q_{15}q_{38} - 131872q_3q_{51} - 32q_5q_{49} - 64q_{10}q_{44} - \\
& 64q_{15}q_{39} - 131872q_3q_{52} - 131872q_5q_{50} - 131872q_{10}q_{45} - 64q_{11}q_{44} + 64q_{16}q_{39} - 131872q_3q_{53} - 32q_6q_{50} - \\
& 16q_7q_{49} - 64q_{11}q_{45} - 131872q_3q_{54} - 131872q_6q_{51} - 131872q_3q_{55} - 32q_7q_{51} - 131872q_{12}q_{46} - 131872q_3q_{56} - \\
& 64q_{13}q_{46} - 131872q_3q_{57} - 131872q_8q_{52} - 131872q_{13}q_{47} - 64q_{14}q_{46} - 64q_9q_{52} - 64q_{14}q_{47} - 131872q_4q_{58} - \\
& 131872q_9q_{53} - 131872q_{14}q_{48} - 64q_{15}q_{47} - 131872q_4q_{59} - 131872q_5q_{58} - 64q_{10}q_{53} - 32q_{11}q_{52} - 64q_{15}q_{48} - \\
& 131872q_4q_{60} - 131872q_{10}q_{54} - 131872q_4q_{61} - 131872q_6q_{59} - 96q_7q_{58} - 64q_{11}q_{54} - 131872q_4q_{62} + 32q_7q_{59} - \\
& 131872q_4q_{63} - 131872q_7q_{60} - 64q_8q_{59} - 64q_9q_{58} - 131872q_{12}q_{55} - 131872q_4q_{64} - 32q_8q_{60} - 64q_{10}q_{58} - \\
& 64q_{13}q_{55} - 131872q_8q_{61} - 131872q_{13}q_{56} - 131872q_5q_{65} - 64q_{11}q_{59} - 64q_{14}q_{56} - 32q_{15}q_{55} - 131872q_5q_{66} - \\
& 131872q_6q_{65} - 131872q_9q_{62} - 64q_{10}q_{61} - 32q_{11}q_{60} - 64q_{12}q_{59} - 64q_{13}q_{58} - 131872q_{14}q_{57} - 131872q_5q_{67} - \\
& 64q_7q_{65} - 32q_{11}q_{61} - 32q_{12}q_{60} - 64q_{14}q_{58} - 64q_{15}q_{57} - 131872q_5q_{68} - 131872q_7q_{66} - 64q_{11}q_{62} - 64q_{13}q_{60} - \\
& 64q_{14}q_{59} - 64q_{15}q_{58} - 131872q_5q_{69} - 64q_8q_{66} - 64q_9q_{65} + 32q_{14}q_{60} - 32q_{15}q_{59} + 32q_{16}q_{58} - 131872q_5q_{70} - \\
& 131872q_8q_{67} - 64q_{10}q_{65} - 131872q_{12}q_{63} - 32q_{15}q_{60} - 131872q_5q_{71} - 64q_9q_{67} + 32q_{17}q_{59} - 131872q_5q_{72} - \\
& 131872q_9q_{68} - 64q_{11}q_{66} - 131872q_{13}q_{64} - 64q_{14}q_{63} - 64q_{10}q_{68} - 64q_{11}q_{67} - 64q_{12}q_{66} - 64q_{13}q_{65} - 32q_{15}q_{63} + \\
& 32q_{18}q_{60} - 131872q_6q_{73} - 131872q_{10}q_{69} - 64q_{14}q_{65} - 64q_{15}q_{64} - 131872q_6q_{74} - 131872q_7q_{73} - 64q_{11}q_{69} - \\
& 64q_{14}q_{66} - 64q_{15}q_{65} - 131872q_6q_{75} - 32q_{15}q_{66} + 32q_{16}q_{65} - 131872q_6q_{76} - 131872q_8q_{74} - 64q_9q_{73} - \\
& 131872q_{12}q_{70} - 131872q_6q_{77} - 64q_9q_{74} - 64q_{10}q_{73} - 64q_{13}q_{70} + 32q_{17}q_{66} - 131872q_6q_{78} - 131872q_9q_{75} - \\
& 64q_{10}q_{74} - 131872q_{13}q_{71} - 131872q_6q_{79} - 64q_{10}q_{75} + 64q_{11}q_{74} - 64q_{14}q_{71} - 64q_{15}q_{70} - 131872q_{10}q_{76} - \\
& 64q_{11}q_{75} - 64q_{13}q_{73} - 131872q_{14}q_{72} + 32q_{28}q_{58} - 131872q_7q_{80} - 64q_{11}q_{76} - 64q_{14}q_{73} - 64q_{15}q_{72} - \\
& 131872q_7q_{81} - 131872q_8q_{80} - 64q_{15}q_{73} + 32q_{29}q_{59} - 131872q_7q_{82} - 64q_9q_{80} - 131872q_{12}q_{77} + 32q_{16}q_{73} - \\
& 131872q_7q_{83} - 131872q_9q_{81} - 64q_{13}q_{77} - 131872q_7q_{84} - 64q_{10}q_{81} - 32q_{11}q_{80} - 131872q_{13}q_{78} - 64q_{14}q_{77} - \\
& 131872q_7q_{85} - 131872q_{10}q_{82} - 64q_{14}q_{78} + 64q_{15}q_{77} - 64q_{11}q_{82} - 131872q_{14}q_{79} - 64q_{15}q_{78} + 32q_{28}q_{65} - \\
& 131872q_8q_{86} - 64q_{15}q_{79} - 131872q_8q_{87} - 131872q_9q_{86} - 131872q_{12}q_{83} + 32q_{29}q_{66} - 131872q_8q_{88} - \\
& 64q_{13}q_{83} - 131872q_8q_{89} - 131872q_{10}q_{87} - 128q_{11}q_{86} - 131872q_{13}q_{84} + 32q_{39}q_{58} - 131872q_8q_{90} - 128q_{11}q_{87} - \\
& 64q_{14}q_{84} - 32q_{15}q_{83} - 131872q_{11}q_{88} - 128q_{12}q_{87} - 128q_{13}q_{86} - 131872q_{14}q_{85} - 131872q_9q_{91} - 64q_{12}q_{88} - \\
& 128q_{14}q_{86} - 64q_{15}q_{85} - 131872q_9q_{83} - 131872q_{10}q_{91} - 131872q_{12}q_{89} - 128q_{13}q_{88} - 128q_{14}q_{87} - 128q_{15}q_{86} + \\
& 32q_{28}q_{73} - 131872q_9q_{93} + 64q_{14}q_{88} - 64q_{15}q_{87} + 64q_{16}q_{86} - 131872q_9q_{94} - 131872q_{11}q_{83} - 131872q_{13}q_{90} - \\
& 128q_{14}q_{89} - 64q_{15}q_{88} - 131872q_9q_{95} - 128q_{12}q_{83} - 128q_{13}q_{91} - 64q_{15}q_{89} + 64q_{17}q_{87} + 32q_{39}q_{65} - \\
& 131872q_{12}q_{93} - 128q_{14}q_{91} - 128q_{15}q_{90} - 131872q_{10}q_{96} - 128q_{13}q_{93} - 128q_{14}q_{83} - 128q_{15}q_{91} + 64q_{18}q_{88} - \\
& 131872q_{10}q_{97} - 131872q_{11}q_{96} - 131872q_{13}q_{94} - 64q_{15}q_{83} + 64q_{16}q_{91} - 131872q_{10}q_{98} - 128q_{14}q_{94} - \\
& 131872q_{10}q_{99} - 131872q_{12}q_{97} - 128q_{13}q_{96} - 131872q_{14}q_{95} + 64q_{17}q_{83} - 128q_{13}q_{97} - 128q_{14}q_{96} - 128q_{15}q_{95} - \\
& 131872q_{11}q_{100} - 131872q_{13}q_{98} - 128q_{15}q_{96} - 131872q_{11}q_{101} - 131872q_{12}q_{100} - 128q_{14}q_{98} + 64q_{16}q_{96} + \\
& 32q_{39}q_{73} - 131872q_{14}q_{99} - 131872q_{12}q_{102} - 131872q_{13}q_{101} - 128q_{14}q_{100} - 128q_{15}q_{99} + 64q_{28}q_{86} - \\
& 131872q_{12}q_{103} - 131872q_{13}q_{102} - 64q_{15}q_{100} - 131872q_{12}q_{104} - 128q_{15}q_{101} + 64q_{29}q_{87} - 131872q_{14}q_{103} - \\
& 384q_{15}q_{102} - 131872q_{13}q_{105} + 64q_{16}q_{102} - 131872q_{13}q_{106} - 131872q_{14}q_{105} - 131872q_{15}q_{104} + 64q_{28}q_{91} - \\
& 256q_{15}q_{105} + 64q_{17}q_{103} - 131872q_{14}q_{107} - 131872q_{15}q_{106} + 64q_{16}q_{105} + 64q_{29}q_{83} - 131872q_{15}q_{107} + \\
& 64q_{18}q_{104} + 64q_{16}q_{107} + 64q_{17}q_{106} + 64q_{28}q_{96} + 64q_{39}q_{86} + 64q_{28}q_{102} + 64q_{39}q_{91} + 64q_{58}q_{73} + 64q_{29}q_{103} + \\
& 64q_{28}q_{105} + 64q_{28}q_{107} + 64q_{29}q_{106} + 64q_{39}q_{96} + 64q_{39}q_{102} + 64q_{39}q_{105} + 64q_{58}q_{86} + 64q_{39}q_{107} + 64q_{59}q_{87} + \\
& 64q_{60}q_{88} + 64q_{58}q_{91} + 64q_{59}q_{83} + 64q_{65}q_{86} + 64q_{66}q_{87} + 64q_{58}q_{96} + 64q_{65}q_{91} + 64q_{66}q_{83} + 64q_{73}q_{86} + \\
& 64q_{58}q_{102} + 64q_{65}q_{96} + 64q_{59}q_{103} + 64q_{58}q_{105} + 64q_{60}q_{104} + 64q_{73}q_{91} + 64q_{58}q_{107} + 64q_{59}q_{106} + 64q_{65}q_{102} + \\
& 64q_{66}q_{103} + 64q_{73}q_{96} + 64q_{65}q_{105} + 64q_{65}q_{107} + 64q_{66}q_{106} + 64q_{73}q_{102} + 64q_{73}q_{105} + 64q_{73}q_{107} + 256q_{86}q_{96} + \\
& 128q_{86}q_{102} + 128q_{87}q_{103} + 128q_{86}q_{105} + 128q_{88}q_{104} + 128q_{86}q_{107} + 128q_{87}q_{106} + 128q_{91}q_{102} + 128q_{83}q_{103} + \\
& 128q_{91}q_{105} + 128q_{91}q_{107} + 128q_{83}q_{106} + 128q_{96}q_{102} + 128q_{96}q_{105} + 128q_{96}q_{107} + 256q_{102}q_{107} + 472
\end{aligned}$$

0.1 A complete expression of $E_2(s)$ in 92-order H matrix using extended-Turyn based method

$$\begin{aligned}
E_2(s) = & 197860s_0 + 197832s_1 + 197872s_2 + 197880s_3 + 181374s_4 + 214362s_5 + 214402s_6 + 148454s_7 + \\
& 214436s_8 + 231000s_9 + 214592s_{10} + 82772s_{11} + 247556s_{12} + 247772s_{13} + 198456s_{14} + 50116s_{15} - 33004s_{16} -
\end{aligned}$$

$$\begin{aligned}
& 33028s_{17} - 33012s_{18} - 32976s_{19} - 32972s_{20} - 32988s_{21} - 32952s_{22} - 32976s_{23} - 32992s_{24} - 32976s_{25} - \\
& 32984s_{26} - 33016s_{27} - 33004s_{28} - 33036s_{29} - 32964s_{30} - 32988s_{31} - 32972s_{32} - 32976s_{33} - 32960s_{34} - \\
& 32976s_{35} - 32960s_{36} - 33000s_{37} - 32992s_{38} - 33028s_{39} - 32972s_{40} - 32964s_{41} - 32996s_{42} - 32960s_{43} - \\
& 32976s_{44} - 32992s_{45} - 32976s_{46} - 32968s_{47} - 33024s_{48} - 32960s_{49} - 32980s_{50} - 32972s_{51} - 32952s_{52} - \\
& 32992s_{53} - 32992s_{54} - 32960s_{55} - 33000s_{56} - 32984s_{57} - 33028s_{58} - 33036s_{59} - 32996s_{60} - 32968s_{61} - \\
& 32960s_{62} - 32992s_{63} - 32968s_{64} - 32996s_{65} - 33076s_{66} - 32960s_{67} - 32976s_{68} - 32976s_{69} - 32944s_{70} - \\
& 33016s_{71} - 32960s_{72} - 33036s_{73} - 32960s_{74} - 32976s_{75} - 32992s_{76} - 32976s_{77} - 32936s_{78} - 33040s_{79} - \\
& 32968s_{80} - 32976s_{81} - 32976s_{82} - 32944s_{83} - 33000s_{84} - 32968s_{85} - 33112s_{86} - 33064s_{87} - 33144s_{88} - \\
& 32984s_{89} - 32968s_{90} - 33112s_{91} - 33096s_{92} - 32952s_{93} - 33000s_{94} - 33016s_{95} - 33144s_{96} - 32952s_{97} - \\
& 33000s_{98} - 33016s_{99} - 32984s_{100} - 32968s_{101} - 33192s_{102} - 33192s_{103} - 33112s_{104} - 33096s_{105} - 33320s_{106} - \\
& 33256s_{107} + 16484s_{0s1} + 16484s_{0s2} + 16484s_{0s3} + 16484s_{1s2} + 16484s_{0s4} + 16484s_{1s3} + 16484s_{0s5} + 16484s_{1s4} + \\
& 16484s_{2s3} + 16484s_{0s6} + 16484s_{1s5} + 16484s_{2s4} + 6s_{0s7} + 16484s_{1s6} + 16484s_{2s5} + 16484s_{3s4} + 16484s_{0s8} + \\
& 14s_{1s7} + 16484s_{2s6} + 16484s_{3s5} + 16484s_{0s9} + 16484s_{1s8} + 6s_{2s7} + 16484s_{3s6} + 16484s_{4s5} + 16484s_{0s10} + \\
& 16484s_{1s9} + 16484s_{2s8} + 10s_{3s7} + 16484s_{4s6} + 12s_{0s11} + 16484s_{1s10} + 16484s_{2s9} + 16484s_{3s8} + 16484s_{4s7} + \\
& 16484s_{5s6} + 16484s_{0s12} + 28s_{1s11} + 16484s_{2s10} + 16484s_{3s9} + 16484s_{4s8} + 16484s_{5s7} + 16484s_{0s13} + 16484s_{1s12} + \\
& 12s_{2s11} + 16484s_{3s10} + 16484s_{4s9} + 16484s_{5s8} + 16484s_{6s7} + 16484s_{0s14} + 16484s_{1s13} + 16484s_{2s12} + 4s_{3s11} + \\
& 4s_{4s10} + 16484s_{5s9} + 16484s_{6s8} + 20s_{0s15} + 16484s_{1s14} + 16484s_{2s13} + 16484s_{3s12} + 12s_{4s11} + 16484s_{5s10} + \\
& 16484s_{6s9} + 16484s_{7s8} - 32968s_{0s16} + 36s_{1s15} + 16484s_{2s14} + 16484s_{3s13} + 16484s_{4s12} + 12s_{5s11} + 16484s_{6s10} + \\
& 16484s_{7s9} - 32968s_{0s17} - 32968s_{1s16} + 20s_{2s15} + 16484s_{3s14} + 16484s_{4s13} + 16484s_{5s12} + 4s_{6s11} + 16484s_{7s10} + \\
& 16484s_{8s9} - 32968s_{0s18} - 16s_{2s16} + 20s_{3s15} + 16s_{4s14} + 16484s_{5s13} + 16484s_{6s12} + 12s_{7s11} + 16484s_{8s10} - \\
& 32968s_{0s19} - 32968s_{2s17} - 24s_{3s16} + 4s_{4s15} + 16484s_{5s14} + 16484s_{6s13} + 16484s_{7s12} + 16484s_{8s11} + 16484s_{9s10} - \\
& 32968s_{0s20} - 8s_{3s17} + 28s_{5s15} + 16484s_{6s14} + 16484s_{7s13} + 16484s_{8s12} + 16484s_{9s11} - 32968s_{0s21} - 32968s_{3s18} - \\
& 8s_{4s17} - 8s_{5s16} + 12s_{6s15} + 16484s_{7s14} + 16484s_{8s13} + 16484s_{9s12} + 16484s_{10s11} - 32968s_{0s22} - 4s_{4s18} - \\
& 8s_{6s16} + 28s_{7s15} + 16s_{8s14} + 16484s_{9s13} + 16484s_{10s12} - 32968s_{0s23} - 32968s_{4s19} - 8s_{5s18} - 8s_{6s17} - 8s_{7s16} + \\
& 40s_{8s15} + 16484s_{9s14} + 16484s_{10s13} + 16484s_{11s12} - 32968s_{0s24} - 8s_{5s19} + 8s_{6s18} + 24s_{9s15} + 16484s_{10s14} + \\
& 16484s_{11s13} - 32968s_{0s25} - 32968s_{5s20} - 8s_{6s19} - 4s_{7s18} - 16s_{8s17} - 16s_{9s16} + 24s_{10s15} + 16s_{11s14} + 16484s_{12s13} - \\
& 32968s_{0s26} - 8s_{6s20} - 4s_{7s19} - 8s_{8s18} - 16s_{10s16} + 40s_{11s15} + 16484s_{12s14} - 32968s_{0s27} - 32968s_{6s21} - 8s_{7s20} + \\
& 16484s_{12s15} + 16484s_{13s14} - 8s_{7s21} - 16s_{11s17} + 16484s_{13s15} - 32968s_{1s28} - 8s_{11s18} - 16s_{12s17} - 16s_{13s16} + \\
& 16484s_{14s15} - 32968s_{1s29} - 32968s_{2s28} - 32968s_{8s22} - 8s_{12s18} - 16s_{14s16} - 32968s_{1s30} - 16s_{3s28} - 16s_{9s22} - \\
& 16s_{13s18} - 16s_{14s17} - 16s_{15s16} - 32968s_{1s31} - 32968s_{3s29} - 32968s_{9s23} - 16s_{10s22} + 8s_{14s18} - 8s_{15s17} - \\
& 32968s_{1s32} - 8s_{4s29} - 8s_{5s28} - 16s_{10s23} - 8s_{11s22} - 8s_{15s18} - 32968s_{1s33} - 32968s_{4s30} - 8s_{6s28} - 32968s_{10s24} - \\
& 16s_{11s23} - 32968s_{1s34} - 8s_{5s30} - 8s_{6s29} - 8s_{7s28} - 16s_{11s24} - 32968s_{1s35} - 32968s_{5s31} - 8s_{6s30} - 32968s_{1s36} - \\
& 8s_{6s31} - 8s_{7s30} - 16s_{8s29} - 16s_{9s28} - 32968s_{12s25} - 32968s_{1s37} - 32968s_{6s32} - 8s_{7s31} - 16s_{10s28} - 16s_{13s25} - \\
& 32968s_{1s38} - 8s_{7s32} - 32968s_{13s26} - 16s_{14s25} - 16s_{11s29} - 16s_{14s26} - 8s_{15s25} - 32968s_{2s39} - 32968s_{8s33} - \\
& 16s_{12s29} - 16s_{13s28} - 32968s_{14s27} - 16s_{15s26} - 32968s_{2s40} - 32968s_{3s39} - 16s_{9s33} - 16s_{14s28} - 16s_{15s27} - \\
& 32968s_{2s41} - 32968s_{9s34} - 16s_{10s33} - 16s_{14s29} - 16s_{15s28} - 32968s_{2s42} - 32968s_{4s40} - 8s_{5s39} - 16s_{10s34} - \\
& 16s_{11s33} - 8s_{15s29} - 32968s_{2s43} - 8s_{5s40} - 8s_{6s39} - 32968s_{10s35} - 16s_{11s34} - 32968s_{2s44} - 32968s_{5s41} - \\
& 8s_{6s40} - 8s_{7s39} - 16s_{11s35} - 32968s_{2s45} - 8s_{6s41} - 32968s_{2s46} - 32968s_{6s42} - 8s_{7s41} - 16s_{9s39} - 32968s_{12s36} - \\
& 32968s_{2s47} - 8s_{7s42} - 16s_{10s39} - 16s_{13s36} - 32968s_{2s48} - 32968s_{13s37} - 16s_{14s36} - 32968s_{8s43} - 16s_{14s37} - \\
& 16s_{15s36} - 32968s_{3s49} - 16s_{9s43} - 16s_{13s39} - 32968s_{14s38} - 16s_{15s37} - 32968s_{3s50} - 32968s_{4s49} - 32968s_{9s44} - \\
& 16s_{10s43} - 16s_{14s39} - 16s_{15s38} - 32968s_{3s51} - 8s_{5s49} - 16s_{10s44} - 16s_{15s39} - 32968s_{3s52} - 32968s_{5s50} - \\
& 32968s_{10s45} - 16s_{11s44} + 16s_{16s39} - 32968s_{3s53} - 8s_{6s50} - 4s_{7s49} - 16s_{11s45} - 32968s_{3s54} - 32968s_{6s51} - \\
& 32968s_{3s55} - 8s_{7s51} - 32968s_{12s46} - 32968s_{3s56} - 16s_{13s46} - 32968s_{3s57} - 32968s_{8s52} - 32968s_{13s47} - \\
& 16s_{14s46} - 16s_{9s52} - 16s_{14s47} - 32968s_{4s58} - 32968s_{9s53} - 32968s_{14s48} - 16s_{15s47} - 32968s_{4s59} - 32968s_{5s58} - \\
& 16s_{10s53} - 8s_{11s52} - 16s_{15s48} - 32968s_{4s60} - 32968s_{10s54} - 32968s_{4s61} - 32968s_{6s59} - 24s_{7s58} - 16s_{11s54} - \\
& 32968s_{4s62} + 8s_{7s59} - 32968s_{4s63} - 32968s_{7s60} - 16s_{8s59} - 16s_{9s58} - 32968s_{12s55} - 32968s_{4s64} - 8s_{8s60} - \\
& 16s_{10s58} - 16s_{13s55} - 32968s_{8s61} - 32968s_{13s56} - 32968s_{5s65} - 16s_{11s59} - 16s_{14s56} - 8s_{15s55} - 32968s_{5s66} - \\
& 32968s_{6s65} - 32968s_{9s62} - 16s_{10s61} - 8s_{11s60} - 16s_{12s59} - 16s_{13s58} - 32968s_{14s57} - 32968s_{5s67} - 16s_{7s65} -
\end{aligned}$$

$$\begin{aligned}
& 8s_{11}s_{61} - 8s_{12}s_{60} - 16s_{14}s_{58} - 16s_{15}s_{57} - 32968s_5s_{68} - 32968s_7s_{66} - 16s_{11}s_{62} - 16s_{13}s_{60} - 16s_{14}s_{59} - 16s_{15}s_{58} - \\
& 32968s_5s_{69} - 16s_8s_{66} - 16s_9s_{65} + 8s_{14}s_{60} - 8s_{15}s_{59} + 8s_{16}s_{58} - 32968s_5s_{70} - 32968s_8s_{67} - 16s_{10}s_{65} - 32968s_{12}s_{63} - \\
& 8s_{15}s_{60} - 32968s_5s_{71} - 16s_9s_{67} + 8s_{17}s_{59} - 32968s_5s_{72} - 32968s_9s_{68} - 16s_{11}s_{66} - 32968s_{13}s_{64} - 16s_{14}s_{63} - \\
& 16s_{10}s_{68} - 16s_{11}s_{67} - 16s_{12}s_{66} - 16s_{13}s_{65} - 8s_{15}s_{63} + 8s_{18}s_{60} - 32968s_6s_{73} - 32968s_{10}s_{69} - 16s_{14}s_{65} - 16s_{15}s_{64} - \\
& 32968s_6s_{74} - 32968s_7s_{73} - 16s_{11}s_{69} - 16s_{14}s_{66} - 16s_{15}s_{65} - 32968s_6s_{75} - 8s_{15}s_{66} + 8s_{16}s_{65} - 32968s_6s_{76} - \\
& 32968s_8s_{74} - 16s_9s_{73} - 32968s_{12}s_{70} - 32968s_6s_{77} - 16s_9s_{74} - 16s_{10}s_{73} - 16s_{13}s_{70} + 8s_{17}s_{66} - 32968s_6s_{78} - \\
& 32968s_9s_{75} - 16s_{10}s_{74} - 32968s_{13}s_{71} - 32968s_6s_{79} - 16s_{10}s_{75} + 16s_{11}s_{74} - 16s_{14}s_{71} - 16s_{15}s_{70} - 32968s_{10}s_{76} - \\
& 16s_{11}s_{75} - 16s_{13}s_{73} - 32968s_{14}s_{72} + 8s_{28}s_{58} - 32968s_7s_{80} - 16s_{11}s_{76} - 16s_{14}s_{73} - 16s_{15}s_{72} - 32968s_7s_{81} - \\
& 32968s_8s_{80} - 16s_{15}s_{73} + 8s_{29}s_{59} - 32968s_7s_{82} - 16s_9s_{80} - 32968s_{12}s_{77} + 8s_{16}s_{73} - 32968s_7s_{83} - 32968s_9s_{81} - \\
& 16s_{13}s_{77} - 32968s_7s_{84} - 16s_{10}s_{81} - 8s_{11}s_{80} - 32968s_{13}s_{78} - 16s_{14}s_{77} - 32968s_7s_{85} - 32968s_{10}s_{82} - 16s_{14}s_{78} + \\
& 16s_{15}s_{77} - 16s_{11}s_{82} - 32968s_{14}s_{79} - 16s_{15}s_{78} + 8s_{28}s_{65} - 32968s_8s_{86} - 16s_{15}s_{79} - 32968s_8s_{87} - 32968s_9s_{86} - \\
& 32968s_{12}s_{83} + 8s_{29}s_{66} - 32968s_8s_{88} - 16s_{13}s_{83} - 32968s_8s_{89} - 32968s_{10}s_{87} - 32s_{11}s_{86} - 32968s_{13}s_{84} + 8s_{39}s_{58} - \\
& 32968s_8s_{90} - 32s_{11}s_{87} - 16s_{14}s_{84} - 8s_{15}s_{83} - 32968s_{11}s_{88} - 32s_{12}s_{87} - 32s_{13}s_{86} - 32968s_{14}s_{85} - 32968s_9s_{91} - \\
& 16s_{12}s_{88} - 32s_{14}s_{86} - 16s_{15}s_{85} - 32968s_9s_{92} - 32968s_{10}s_{91} - 32968s_{12}s_{89} - 32s_{13}s_{88} - 32s_{14}s_{87} - 32s_{15}s_{86} + \\
& 8s_{28}s_{73} - 32968s_9s_{93} + 16s_{14}s_{88} - 16s_{15}s_{87} + 16s_{16}s_{86} - 32968s_9s_{94} - 32968s_{11}s_{92} - 32968s_{13}s_{90} - 32s_{14}s_{89} - \\
& 16s_{15}s_{88} - 32968s_9s_{95} - 32s_{12}s_{92} - 32s_{13}s_{91} - 16s_{15}s_{89} + 16s_{17}s_{87} + 8s_{39}s_{65} - 32968s_{12}s_{93} - 32s_{14}s_{91} - \\
& 32s_{15}s_{90} - 32968s_{10}s_{96} - 32s_{13}s_{93} - 32s_{14}s_{92} - 32s_{15}s_{91} + 16s_{18}s_{88} - 32968s_{10}s_{97} - 32968s_{11}s_{96} - 32968s_{13}s_{94} - \\
& 16s_{15}s_{92} + 16s_{16}s_{91} - 32968s_{10}s_{98} - 32s_{14}s_{94} - 32968s_{10}s_{99} - 32968s_{12}s_{97} - 32s_{13}s_{96} - 32968s_{14}s_{95} + 16s_{17}s_{92} - \\
& 32s_{13}s_{97} - 32s_{14}s_{96} - 32s_{15}s_{95} - 32968s_{11}s_{100} - 32968s_{13}s_{98} - 32s_{15}s_{96} - 32968s_{11}s_{101} - 32968s_{12}s_{100} - \\
& 32s_{14}s_{98} + 16s_{16}s_{96} + 8s_{39}s_{73} - 32968s_{14}s_{99} - 32968s_{12}s_{102} - 32968s_{13}s_{101} - 32s_{14}s_{100} - 32s_{15}s_{99} + 16s_{28}s_{86} - \\
& 32968s_{12}s_{103} - 32968s_{13}s_{102} - 16s_{15}s_{100} - 32968s_{12}s_{104} - 32s_{15}s_{101} + 16s_{29}s_{87} - 32968s_{14}s_{103} - 96s_{15}s_{102} - \\
& 32968s_{13}s_{105} + 16s_{16}s_{102} - 32968s_{13}s_{106} - 32968s_{14}s_{105} - 32968s_{15}s_{104} + 16s_{28}s_{91} - 64s_{15}s_{105} + 16s_{17}s_{103} - \\
& 32968s_{14}s_{107} - 32968s_{15}s_{106} + 16s_{16}s_{105} + 16s_{29}s_{92} - 32968s_{15}s_{107} + 16s_{18}s_{104} + 16s_{16}s_{107} + 16s_{17}s_{106} + \\
& 16s_{28}s_{96} + 16s_{39}s_{86} + 16s_{28}s_{102} + 16s_{39}s_{91} + 16s_{58}s_{73} + 16s_{29}s_{103} + 16s_{28}s_{105} + 16s_{28}s_{107} + 16s_{29}s_{106} + 16s_{39}s_{96} + \\
& 16s_{39}s_{102} + 16s_{39}s_{105} + 16s_{58}s_{86} + 16s_{39}s_{107} + 16s_{59}s_{87} + 16s_{60}s_{88} + 16s_{58}s_{91} + 16s_{59}s_{92} + 16s_{65}s_{86} + 16s_{66}s_{87} + \\
& 16s_{58}s_{96} + 16s_{65}s_{91} + 16s_{66}s_{92} + 16s_{73}s_{86} + 16s_{58}s_{102} + 16s_{65}s_{96} + 16s_{59}s_{103} + 16s_{58}s_{105} + 16s_{60}s_{104} + 16s_{73}s_{91} + \\
& 16s_{58}s_{107} + 16s_{59}s_{106} + 16s_{65}s_{102} + 16s_{66}s_{103} + 16s_{73}s_{96} + 16s_{65}s_{105} + 16s_{65}s_{107} + 16s_{66}s_{106} + 16s_{73}s_{102} + \\
& 16s_{73}s_{105} + 16s_{73}s_{107} + 64s_{86}s_{96} + 32s_{86}s_{102} + 32s_{87}s_{103} + 32s_{86}s_{105} + 32s_{88}s_{104} + 32s_{86}s_{107} + 32s_{87}s_{106} + \\
& 32s_{91}s_{102} + 32s_{92}s_{103} + 32s_{91}s_{105} + 32s_{91}s_{107} + 32s_{92}s_{106} + 32s_{96}s_{102} + 32s_{96}s_{105} + 32s_{96}s_{107} + 64s_{102}s_{107} + 4551232
\end{aligned}$$

0.2 A complete expression of $\hat{H}_2(\hat{\sigma}^z)$ in 92-order H matrix using extended-Turyn based method

$$\begin{aligned}
\hat{H}_2(\hat{\sigma}^z) = & 197860\hat{\sigma}_0^z + 197832\hat{\sigma}_1^z + 197872\hat{\sigma}_2^z + 197880\hat{\sigma}_3^z + 181374\hat{\sigma}_4^z + 214362\hat{\sigma}_5^z + 214402\hat{\sigma}_6^z + 148454\hat{\sigma}_7^z + \\
& 214436\hat{\sigma}_8^z + 231000\hat{\sigma}_9^z + 214592\hat{\sigma}_{10}^z + 82772\hat{\sigma}_{11}^z + 247556\hat{\sigma}_{12}^z + 247772\hat{\sigma}_{13}^z + 198456\hat{\sigma}_{14}^z + 50116\hat{\sigma}_{15}^z - \\
& 33004\hat{\sigma}_{16}^z - 33028\hat{\sigma}_{17}^z - 33012\hat{\sigma}_{18}^z - 32976\hat{\sigma}_{19}^z - 32972\hat{\sigma}_{20}^z - 32988\hat{\sigma}_{21}^z - 32952\hat{\sigma}_{22}^z - 32976\hat{\sigma}_{23}^z - 32992\hat{\sigma}_{24}^z - \\
& 32976\hat{\sigma}_{25}^z - 32984\hat{\sigma}_{26}^z - 33016\hat{\sigma}_{27}^z - 33004\hat{\sigma}_{28}^z - 33036\hat{\sigma}_{29}^z - 32964\hat{\sigma}_{30}^z - 32988\hat{\sigma}_{31}^z - 32972\hat{\sigma}_{32}^z - 32976\hat{\sigma}_{33}^z - \\
& 32960\hat{\sigma}_{34}^z - 32976\hat{\sigma}_{35}^z - 32960\hat{\sigma}_{36}^z - 33000\hat{\sigma}_{37}^z - 32992\hat{\sigma}_{38}^z - 33028\hat{\sigma}_{39}^z - 32972\hat{\sigma}_{40}^z - 32964\hat{\sigma}_{41}^z - 32996\hat{\sigma}_{42}^z - \\
& 32960\hat{\sigma}_{43}^z - 32976\hat{\sigma}_{44}^z - 32992\hat{\sigma}_{45}^z - 32976\hat{\sigma}_{46}^z - 32968\hat{\sigma}_{47}^z - 33024\hat{\sigma}_{48}^z - 32960\hat{\sigma}_{49}^z - 32980\hat{\sigma}_{50}^z - 32972\hat{\sigma}_{51}^z - \\
& 32952\hat{\sigma}_{52}^z - 32992\hat{\sigma}_{53}^z - 32992\hat{\sigma}_{54}^z - 32960\hat{\sigma}_{55}^z - 33000\hat{\sigma}_{56}^z - 32984\hat{\sigma}_{57}^z - 33028\hat{\sigma}_{58}^z - 33036\hat{\sigma}_{59}^z - 32996\hat{\sigma}_{60}^z - \\
& 32968\hat{\sigma}_{61}^z - 32960\hat{\sigma}_{62}^z - 32992\hat{\sigma}_{63}^z - 32968\hat{\sigma}_{64}^z - 32996\hat{\sigma}_{65}^z - 33076\hat{\sigma}_{66}^z - 32960\hat{\sigma}_{67}^z - 32976\hat{\sigma}_{68}^z - 32976\hat{\sigma}_{69}^z - \\
& 32944\hat{\sigma}_{70}^z - 33016\hat{\sigma}_{71}^z - 32960\hat{\sigma}_{72}^z - 33036\hat{\sigma}_{73}^z - 32960\hat{\sigma}_{74}^z - 32976\hat{\sigma}_{75}^z - 32992\hat{\sigma}_{76}^z - 32976\hat{\sigma}_{77}^z - 32936\hat{\sigma}_{78}^z - \\
& 33040\hat{\sigma}_{79}^z - 32968\hat{\sigma}_{80}^z - 32976\hat{\sigma}_{81}^z - 32976\hat{\sigma}_{82}^z - 32944\hat{\sigma}_{83}^z - 33000\hat{\sigma}_{84}^z - 32968\hat{\sigma}_{85}^z - 33112\hat{\sigma}_{86}^z - 33064\hat{\sigma}_{87}^z - \\
& 33144\hat{\sigma}_{88}^z - 32984\hat{\sigma}_{89}^z - 32968\hat{\sigma}_{90}^z - 33112\hat{\sigma}_{91}^z - 33096\hat{\sigma}_{92}^z - 32952\hat{\sigma}_{93}^z - 33000\hat{\sigma}_{94}^z - 33016\hat{\sigma}_{95}^z - 33144\hat{\sigma}_{96}^z - \\
& 32952\hat{\sigma}_{97}^z - 33000\hat{\sigma}_{98}^z - 33016\hat{\sigma}_{99}^z - 32984\hat{\sigma}_{100}^z - 32968\hat{\sigma}_{101}^z - 33192\hat{\sigma}_{102}^z - 33192\hat{\sigma}_{103}^z - 33112\hat{\sigma}_{104}^z - \\
& 33096\hat{\sigma}_{105}^z - 33320\hat{\sigma}_{106}^z - 33256\hat{\sigma}_{107}^z + 16484\hat{\sigma}_0^z\hat{\sigma}_1^z + 16484\hat{\sigma}_0^z\hat{\sigma}_2^z + 16484\hat{\sigma}_0^z\hat{\sigma}_3^z + 16484\hat{\sigma}_1^z\hat{\sigma}_2^z + 16484\hat{\sigma}_0^z\hat{\sigma}_4^z + \\
& 16484\hat{\sigma}_1^z\hat{\sigma}_3^z + 16484\hat{\sigma}_0^z\hat{\sigma}_5^z + 16484\hat{\sigma}_1^z\hat{\sigma}_4^z + 16484\hat{\sigma}_2^z\hat{\sigma}_3^z + 16484\hat{\sigma}_0^z\hat{\sigma}_6^z + 16484\hat{\sigma}_1^z\hat{\sigma}_5^z + 16484\hat{\sigma}_2^z\hat{\sigma}_4^z + 6\hat{\sigma}_0^z\hat{\sigma}_7^z + \\
& 16484\hat{\sigma}_1^z\hat{\sigma}_6^z + 16484\hat{\sigma}_2^z\hat{\sigma}_5^z + 16484\hat{\sigma}_3^z\hat{\sigma}_4^z + 16484\hat{\sigma}_0^z\hat{\sigma}_8^z + 14\hat{\sigma}_1^z\hat{\sigma}_7^z + 16484\hat{\sigma}_2^z\hat{\sigma}_6^z + 16484\hat{\sigma}_3^z\hat{\sigma}_5^z + 16484\hat{\sigma}_0^z\hat{\sigma}_9^z + \\
& 16484\hat{\sigma}_1^z\hat{\sigma}_8^z + 6\hat{\sigma}_2^z\hat{\sigma}_7^z + 16484\hat{\sigma}_3^z\hat{\sigma}_6^z + 16484\hat{\sigma}_4^z\hat{\sigma}_5^z + 16484\hat{\sigma}_0^z\hat{\sigma}_{10}^z + 16484\hat{\sigma}_1^z\hat{\sigma}_9^z + 16484\hat{\sigma}_2^z\hat{\sigma}_8^z + 10\hat{\sigma}_3^z\hat{\sigma}_7^z +
\end{aligned}$$

$$\begin{aligned}
& 16484\sigma_4^z\sigma_6^z + 12\sigma_0^z\sigma_{11}^z + 16484\sigma_7^z\sigma_{10}^z + 16484\sigma_2^z\sigma_9^z + 16484\sigma_3^z\sigma_8^z + 16484\sigma_5^z\sigma_6^z + 16484\sigma_0^z\sigma_{12}^z + \\
& 28\sigma_7^z\sigma_{11}^z + 16484\sigma_2^z\sigma_{10}^z + 16484\sigma_3^z\sigma_9^z + 16484\sigma_4^z\sigma_8^z + 16484\sigma_5^z\sigma_7^z + 16484\sigma_0^z\sigma_{13}^z + 16484\sigma_7^z\sigma_{12}^z + 12\sigma_2^z\sigma_{11}^z + \\
& 16484\sigma_3^z\sigma_{10}^z + 16484\sigma_4^z\sigma_9^z + 16484\sigma_5^z\sigma_8^z + 16484\sigma_6^z\sigma_7^z + 16484\sigma_0^z\sigma_{14}^z + 16484\sigma_1^z\sigma_{13}^z + 16484\sigma_2^z\sigma_{12}^z + 4\sigma_3^z\sigma_{11}^z + \\
& 4\sigma_4^z\sigma_{10}^z + 16484\sigma_5^z\sigma_9^z + 16484\sigma_6^z\sigma_8^z + 20\sigma_0^z\sigma_{15}^z + 16484\sigma_7^z\sigma_{14}^z + 16484\sigma_2^z\sigma_{13}^z + 16484\sigma_3^z\sigma_{12}^z + 12\sigma_4^z\sigma_{11}^z + \\
& 16484\sigma_5^z\sigma_{10}^z + 16484\sigma_6^z\sigma_9^z + 16484\sigma_7^z\sigma_8^z - 32968\sigma_0^z\sigma_{16}^z + 36\sigma_1^z\sigma_{15}^z + 16484\sigma_2^z\sigma_{14}^z + 16484\sigma_3^z\sigma_{13}^z + 16484\sigma_4^z\sigma_{12}^z + \\
& 12\sigma_5^z\sigma_{11}^z + 16484\sigma_6^z\sigma_{10}^z + 16484\sigma_7^z\sigma_9^z - 32968\sigma_0^z\sigma_{17}^z - 32968\sigma_1^z\sigma_{16}^z + 20\sigma_2^z\sigma_{15}^z + 16484\sigma_3^z\sigma_{14}^z + 16484\sigma_4^z\sigma_{13}^z + \\
& 16484\sigma_5^z\sigma_{12}^z + 4\sigma_6^z\sigma_{11}^z + 16484\sigma_7^z\sigma_{10}^z + 16484\sigma_8^z\sigma_9^z - 32968\sigma_0^z\sigma_{18}^z - 16\sigma_2^z\sigma_{16}^z + 20\sigma_3^z\sigma_{15}^z + 16\sigma_4^z\sigma_{14}^z + 16484\sigma_5^z\sigma_{13}^z + \\
& 16484\sigma_6^z\sigma_{12}^z + 12\sigma_7^z\sigma_{11}^z + 16484\sigma_8^z\sigma_{10}^z - 32968\sigma_0^z\sigma_{19}^z - 32968\sigma_2^z\sigma_{17}^z - 24\sigma_3^z\sigma_{16}^z + 4\sigma_4^z\sigma_{15}^z + 16484\sigma_5^z\sigma_{14}^z + \\
& 16484\sigma_6^z\sigma_{13}^z + 16484\sigma_7^z\sigma_{12}^z + 16484\sigma_8^z\sigma_{11}^z + 16484\sigma_9^z\sigma_{10}^z - 32968\sigma_0^z\sigma_{20}^z - 8\sigma_3^z\sigma_{17}^z + 28\sigma_5^z\sigma_{15}^z + 16484\sigma_6^z\sigma_{14}^z + \\
& 16484\sigma_7^z\sigma_{13}^z + 16484\sigma_8^z\sigma_{12}^z + 16484\sigma_9^z\sigma_{11}^z - 32968\sigma_0^z\sigma_{21}^z - 32968\sigma_3^z\sigma_{18}^z - 8\sigma_4^z\sigma_{17}^z - 8\sigma_5^z\sigma_{16}^z + 12\sigma_6^z\sigma_{15}^z + \\
& 16484\sigma_7^z\sigma_{14}^z + 16484\sigma_8^z\sigma_{13}^z + 16484\sigma_9^z\sigma_{12}^z + 16484\sigma_{10}^z\sigma_{11}^z - 32968\sigma_0^z\sigma_{22}^z - 4\sigma_4^z\sigma_{18}^z - 8\sigma_6^z\sigma_{16}^z + 28\sigma_7^z\sigma_{15}^z + \\
& 16\sigma_8^z\sigma_{14}^z + 16484\sigma_9^z\sigma_{13}^z + 16484\sigma_{10}^z\sigma_{12}^z - 32968\sigma_0^z\sigma_{23}^z - 32968\sigma_4^z\sigma_{19}^z - 8\sigma_5^z\sigma_{18}^z - 8\sigma_6^z\sigma_{17}^z - 8\sigma_7^z\sigma_{16}^z + 40\sigma_8^z\sigma_{15}^z + \\
& 16484\sigma_9^z\sigma_{14}^z + 16484\sigma_{10}^z\sigma_{13}^z + 16484\sigma_{11}^z\sigma_{12}^z - 32968\sigma_0^z\sigma_{24}^z - 8\sigma_5^z\sigma_{19}^z + 8\sigma_6^z\sigma_{18}^z + 24\sigma_9^z\sigma_{15}^z + 16484\sigma_{10}^z\sigma_{14}^z + \\
& 16484\sigma_{11}^z\sigma_{13}^z - 32968\sigma_0^z\sigma_{25}^z - 32968\sigma_5^z\sigma_{20}^z - 8\sigma_6^z\sigma_{19}^z - 4\sigma_7^z\sigma_{18}^z - 16\sigma_8^z\sigma_{17}^z - 16\sigma_9^z\sigma_{16}^z + 24\sigma_{10}^z\sigma_{15}^z + 16\sigma_{11}^z\sigma_{14}^z + \\
& 16484\sigma_{12}^z\sigma_{13}^z - 32968\sigma_0^z\sigma_{26}^z - 8\sigma_6^z\sigma_{20}^z - 4\sigma_7^z\sigma_{19}^z - 8\sigma_8^z\sigma_{18}^z - 16\sigma_{10}^z\sigma_{16}^z + 40\sigma_{11}^z\sigma_{15}^z + 16484\sigma_{12}^z\sigma_{14}^z - 32968\sigma_0^z\sigma_{27}^z - \\
& 32968\sigma_6^z\sigma_{21}^z - 8\sigma_7^z\sigma_{20}^z + 16484\sigma_{12}^z\sigma_{15}^z + 16484\sigma_{13}^z\sigma_{14}^z - 8\sigma_7^z\sigma_{21}^z - 16\sigma_{11}^z\sigma_{17}^z + 16484\sigma_{13}^z\sigma_{15}^z - 32968\sigma_1^z\sigma_{28}^z - \\
& 8\sigma_{11}^z\sigma_{18}^z - 16\sigma_{12}^z\sigma_{17}^z - 16\sigma_{13}^z\sigma_{16}^z + 16484\sigma_{14}^z\sigma_{15}^z - 32968\sigma_1^z\sigma_{29}^z - 32968\sigma_2^z\sigma_{28}^z - 32968\sigma_8^z\sigma_{22}^z - 8\sigma_{12}^z\sigma_{18}^z - \\
& 16\sigma_{14}^z\sigma_{16}^z - 32968\sigma_7^z\sigma_{30}^z - 16\sigma_3^z\sigma_{28}^z - 16\sigma_9^z\sigma_{22}^z - 16\sigma_{13}^z\sigma_{18}^z - 16\sigma_{14}^z\sigma_{17}^z - 16\sigma_{15}^z\sigma_{16}^z - 32968\sigma_1^z\sigma_{31}^z - 32968\sigma_3^z\sigma_{29}^z - \\
& 32968\sigma_9^z\sigma_{23}^z - 16\sigma_{10}^z\sigma_{22}^z + 8\sigma_{14}^z\sigma_{18}^z - 8\sigma_{15}^z\sigma_{17}^z - 32968\sigma_1^z\sigma_{32}^z - 8\sigma_4^z\sigma_{29}^z - 8\sigma_5^z\sigma_{28}^z - 16\sigma_{10}^z\sigma_{23}^z - 8\sigma_{11}^z\sigma_{22}^z - 8\sigma_{15}^z\sigma_{18}^z - \\
& 32968\sigma_1^z\sigma_{33}^z - 32968\sigma_7^z\sigma_{30}^z - 8\sigma_6^z\sigma_{28}^z - 32968\sigma_{10}^z\sigma_{24}^z - 16\sigma_{11}^z\sigma_{23}^z - 32968\sigma_7^z\sigma_{31}^z - 8\sigma_5^z\sigma_{30}^z - 8\sigma_8^z\sigma_{29}^z - 8\sigma_7^z\sigma_{28}^z - \\
& 16\sigma_{11}^z\sigma_{24}^z - 32968\sigma_1^z\sigma_{35}^z - 32968\sigma_5^z\sigma_{31}^z - 8\sigma_6^z\sigma_{30}^z - 32968\sigma_1^z\sigma_{36}^z - 8\sigma_6^z\sigma_{31}^z - 8\sigma_7^z\sigma_{30}^z - 16\sigma_8^z\sigma_{29}^z - 16\sigma_9^z\sigma_{28}^z - \\
& 32968\sigma_{12}^z\sigma_{25}^z - 32968\sigma_1^z\sigma_{37}^z - 32968\sigma_6^z\sigma_{32}^z - 8\sigma_7^z\sigma_{31}^z - 16\sigma_{10}^z\sigma_{28}^z - 16\sigma_{13}^z\sigma_{25}^z - 32968\sigma_1^z\sigma_{38}^z - 8\sigma_7^z\sigma_{32}^z - \\
& 32968\sigma_{13}^z\sigma_{26}^z - 16\sigma_{14}^z\sigma_{25}^z - 16\sigma_{11}^z\sigma_{29}^z - 16\sigma_{14}^z\sigma_{26}^z - 8\sigma_{15}^z\sigma_{25}^z - 32968\sigma_2^z\sigma_{39}^z - 32968\sigma_8^z\sigma_{33}^z - 16\sigma_{12}^z\sigma_{29}^z - 16\sigma_{13}^z\sigma_{28}^z - \\
& 32968\sigma_{14}^z\sigma_{27}^z - 16\sigma_{15}^z\sigma_{26}^z - 32968\sigma_2^z\sigma_{40}^z - 32968\sigma_3^z\sigma_{39}^z - 16\sigma_9^z\sigma_{33}^z - 16\sigma_{14}^z\sigma_{28}^z - 16\sigma_{15}^z\sigma_{27}^z - 32968\sigma_2^z\sigma_{41}^z - \\
& 32968\sigma_$$

$$\begin{aligned}
& 32968\hat{\sigma}_9^z\hat{\sigma}_{81}^z - 16\hat{\sigma}_{13}^z\hat{\sigma}_{77}^z - 32968\hat{\sigma}_7^z\hat{\sigma}_{84}^z - 16\hat{\sigma}_{10}^z\hat{\sigma}_{81}^z - 8\hat{\sigma}_{11}^z\hat{\sigma}_{80}^z - 32968\hat{\sigma}_{13}^z\hat{\sigma}_{78}^z - 16\hat{\sigma}_{14}^z\hat{\sigma}_{77}^z - 32968\hat{\sigma}_7^z\hat{\sigma}_{85}^z - \\
& 32968\hat{\sigma}_{10}^z\hat{\sigma}_{82}^z - 16\hat{\sigma}_{14}^z\hat{\sigma}_{78}^z + 16\hat{\sigma}_{15}^z\hat{\sigma}_{77}^z - 16\hat{\sigma}_{11}^z\hat{\sigma}_{82}^z - 32968\hat{\sigma}_{14}^z\hat{\sigma}_{79}^z - 16\hat{\sigma}_{15}^z\hat{\sigma}_{78}^z + 8\hat{\sigma}_{28}^z\hat{\sigma}_{65}^z - 32968\hat{\sigma}_8^z\hat{\sigma}_{86}^z - \\
& 16\hat{\sigma}_{15}^z\hat{\sigma}_{79}^z - 32968\hat{\sigma}_8^z\hat{\sigma}_{87}^z - 32968\hat{\sigma}_9^z\hat{\sigma}_{86}^z - 32968\hat{\sigma}_{12}^z\hat{\sigma}_{83}^z + 8\hat{\sigma}_{29}^z\hat{\sigma}_{66}^z - 32968\hat{\sigma}_8^z\hat{\sigma}_{88}^z - 16\hat{\sigma}_{13}^z\hat{\sigma}_{83}^z - 32968\hat{\sigma}_8^z\hat{\sigma}_{89}^z - \\
& 32968\hat{\sigma}_{10}^z\hat{\sigma}_{87}^z - 32\hat{\sigma}_{11}^z\hat{\sigma}_{86}^z - 32968\hat{\sigma}_{13}^z\hat{\sigma}_{84}^z + 8\hat{\sigma}_{39}^z\hat{\sigma}_{58}^z - 32968\hat{\sigma}_8^z\hat{\sigma}_{90}^z - 32\hat{\sigma}_{11}^z\hat{\sigma}_{87}^z - 16\hat{\sigma}_{14}^z\hat{\sigma}_{84}^z - 8\hat{\sigma}_{15}^z\hat{\sigma}_{83}^z - \\
& 32968\hat{\sigma}_{11}^z\hat{\sigma}_{88}^z - 32\hat{\sigma}_{12}^z\hat{\sigma}_{87}^z - 32\hat{\sigma}_{13}^z\hat{\sigma}_{86}^z - 32968\hat{\sigma}_{14}^z\hat{\sigma}_{85}^z - 32968\hat{\sigma}_9^z\hat{\sigma}_{91}^z - 16\hat{\sigma}_{12}^z\hat{\sigma}_{88}^z - 32\hat{\sigma}_{14}^z\hat{\sigma}_{86}^z - 16\hat{\sigma}_{15}^z\hat{\sigma}_{85}^z - \\
& 32968\hat{\sigma}_9^z\hat{\sigma}_{92}^z - 32968\hat{\sigma}_{10}^z\hat{\sigma}_{91}^z - 32968\hat{\sigma}_{12}^z\hat{\sigma}_{89}^z - 32\hat{\sigma}_{13}^z\hat{\sigma}_{88}^z - 32\hat{\sigma}_{14}^z\hat{\sigma}_{87}^z - 32\hat{\sigma}_{15}^z\hat{\sigma}_{86}^z + 8\hat{\sigma}_{28}^z\hat{\sigma}_{73}^z - 32968\hat{\sigma}_9^z\hat{\sigma}_{93}^z + \\
& 16\hat{\sigma}_{14}^z\hat{\sigma}_{88}^z - 16\hat{\sigma}_{15}^z\hat{\sigma}_{87}^z + 16\hat{\sigma}_{16}^z\hat{\sigma}_{86}^z - 32968\hat{\sigma}_9^z\hat{\sigma}_{94}^z - 32968\hat{\sigma}_{11}^z\hat{\sigma}_{92}^z - 32968\hat{\sigma}_{13}^z\hat{\sigma}_{90}^z - 32\hat{\sigma}_{14}^z\hat{\sigma}_{89}^z - 16\hat{\sigma}_{15}^z\hat{\sigma}_{88}^z - \\
& 32968\hat{\sigma}_9^z\hat{\sigma}_{95}^z - 32\hat{\sigma}_{12}^z\hat{\sigma}_{92}^z - 32\hat{\sigma}_{13}^z\hat{\sigma}_{91}^z - 16\hat{\sigma}_{15}^z\hat{\sigma}_{89}^z + 16\hat{\sigma}_{17}^z\hat{\sigma}_{87}^z + 8\hat{\sigma}_{39}^z\hat{\sigma}_{65}^z - 32968\hat{\sigma}_{12}^z\hat{\sigma}_{93}^z - 32\hat{\sigma}_{14}^z\hat{\sigma}_{91}^z - 32\hat{\sigma}_{15}^z\hat{\sigma}_{90}^z - \\
& 32968\hat{\sigma}_{10}^z\hat{\sigma}_{96}^z - 32\hat{\sigma}_{13}^z\hat{\sigma}_{93}^z - 32\hat{\sigma}_{14}^z\hat{\sigma}_{92}^z - 32\hat{\sigma}_{15}^z\hat{\sigma}_{91}^z + 16\hat{\sigma}_{18}^z\hat{\sigma}_{88}^z - 32968\hat{\sigma}_{10}^z\hat{\sigma}_{97}^z - 32968\hat{\sigma}_{11}^z\hat{\sigma}_{96}^z - 32968\hat{\sigma}_{13}^z\hat{\sigma}_{94}^z - \\
& 16\hat{\sigma}_{15}^z\hat{\sigma}_{92}^z + 16\hat{\sigma}_{16}^z\hat{\sigma}_{91}^z - 32968\hat{\sigma}_{10}^z\hat{\sigma}_{98}^z - 32\hat{\sigma}_{14}^z\hat{\sigma}_{94}^z - 32968\hat{\sigma}_{10}^z\hat{\sigma}_{99}^z - 32968\hat{\sigma}_{12}^z\hat{\sigma}_{97}^z - 32\hat{\sigma}_{13}^z\hat{\sigma}_{96}^z - 32968\hat{\sigma}_{14}^z\hat{\sigma}_{95}^z + \\
& 16\hat{\sigma}_{17}^z\hat{\sigma}_{92}^z - 32\hat{\sigma}_{13}^z\hat{\sigma}_{97}^z - 32\hat{\sigma}_{14}^z\hat{\sigma}_{96}^z - 32\hat{\sigma}_{15}^z\hat{\sigma}_{95}^z - 32968\hat{\sigma}_{11}^z\hat{\sigma}_{100}^z - 32968\hat{\sigma}_{13}^z\hat{\sigma}_{98}^z - 32\hat{\sigma}_{15}^z\hat{\sigma}_{96}^z - 32968\hat{\sigma}_{11}^z\hat{\sigma}_{101}^z - \\
& 32968\hat{\sigma}_{12}^z\hat{\sigma}_{100}^z - 32\hat{\sigma}_{14}^z\hat{\sigma}_{98}^z + 16\hat{\sigma}_{16}^z\hat{\sigma}_{96}^z + 8\hat{\sigma}_{39}^z\hat{\sigma}_{73}^z - 32968\hat{\sigma}_{14}^z\hat{\sigma}_{99}^z - 32968\hat{\sigma}_{12}^z\hat{\sigma}_{102}^z - 32968\hat{\sigma}_{13}^z\hat{\sigma}_{101}^z - 32\hat{\sigma}_{14}^z\hat{\sigma}_{100}^z - \\
& 32\hat{\sigma}_{15}^z\hat{\sigma}_{99}^z + 16\hat{\sigma}_{28}^z\hat{\sigma}_{86}^z - 32968\hat{\sigma}_{12}^z\hat{\sigma}_{103}^z - 32968\hat{\sigma}_{13}^z\hat{\sigma}_{102}^z - 16\hat{\sigma}_{15}^z\hat{\sigma}_{100}^z - 32968\hat{\sigma}_{12}^z\hat{\sigma}_{104}^z - 32\hat{\sigma}_{15}^z\hat{\sigma}_{101}^z + 16\hat{\sigma}_{29}^z\hat{\sigma}_{87}^z - \\
& 32968\hat{\sigma}_{14}^z\hat{\sigma}_{103}^z - 96\hat{\sigma}_{15}^z\hat{\sigma}_{102}^z - 32968\hat{\sigma}_{13}^z\hat{\sigma}_{105}^z + 16\hat{\sigma}_{16}^z\hat{\sigma}_{102}^z - 32968\hat{\sigma}_{13}^z\hat{\sigma}_{106}^z - 32968\hat{\sigma}_{14}^z\hat{\sigma}_{105}^z - 32968\hat{\sigma}_{15}^z\hat{\sigma}_{104}^z + \\
& 16\hat{\sigma}_{28}^z\hat{\sigma}_{91}^z - 64\hat{\sigma}_{15}^z\hat{\sigma}_{105}^z + 16\hat{\sigma}_{17}^z\hat{\sigma}_{103}^z - 32968\hat{\sigma}_{14}^z\hat{\sigma}_{107}^z - 32968\hat{\sigma}_{15}^z\hat{\sigma}_{106}^z + 16\hat{\sigma}_{16}^z\hat{\sigma}_{105}^z + 16\hat{\sigma}_{29}^z\hat{\sigma}_{92}^z - 32968\hat{\sigma}_{15}^z\hat{\sigma}_{107}^z + \\
& 16\hat{\sigma}_{18}^z\hat{\sigma}_{104}^z + 16\hat{\sigma}_{16}^z\hat{\sigma}_{107}^z + 16\hat{\sigma}_{17}^z\hat{\sigma}_{106}^z + 16\hat{\sigma}_{28}^z\hat{\sigma}_{96}^z + 16\hat{\sigma}_{39}^z\hat{\sigma}_{86}^z + 16\hat{\sigma}_{28}^z\hat{\sigma}_{102}^z + 16\hat{\sigma}_{39}^z\hat{\sigma}_{91}^z + 16\hat{\sigma}_{58}^z\hat{\sigma}_{73}^z + 16\hat{\sigma}_{29}^z\hat{\sigma}_{103}^z + \\
& 16\hat{\sigma}_{28}^z\hat{\sigma}_{105}^z + 16\hat{\sigma}_{28}^z\hat{\sigma}_{107}^z + 16\hat{\sigma}_{29}^z\hat{\sigma}_{106}^z + 16\hat{\sigma}_{39}^z\hat{\sigma}_{96}^z + 16\hat{\sigma}_{39}^z\hat{\sigma}_{102}^z + 16\hat{\sigma}_{39}^z\hat{\sigma}_{105}^z + 16\hat{\sigma}_{58}^z\hat{\sigma}_{86}^z + 16\hat{\sigma}_{39}^z\hat{\sigma}_{107}^z + 16\hat{\sigma}_{59}^z\hat{\sigma}_{87}^z + \\
& 16\hat{\sigma}_{60}^z\hat{\sigma}_{88}^z + 16\hat{\sigma}_{58}^z\hat{\sigma}_{91}^z + 16\hat{\sigma}_{59}^z\hat{\sigma}_{92}^z + 16\hat{\sigma}_{65}^z\hat{\sigma}_{86}^z + 16\hat{\sigma}_{66}^z\hat{\sigma}_{87}^z + 16\hat{\sigma}_{58}^z\hat{\sigma}_{96}^z + 16\hat{\sigma}_{65}^z\hat{\sigma}_{91}^z + 16\hat{\sigma}_{66}^z\hat{\sigma}_{92}^z + 16\hat{\sigma}_{73}^z\hat{\sigma}_{86}^z + \\
& 16\hat{\sigma}_{58}^z\hat{\sigma}_{102}^z + 16\hat{\sigma}_{65}^z\hat{\sigma}_{96}^z + 16\hat{\sigma}_{59}^z\hat{\sigma}_{103}^z + 16\hat{\sigma}_{58}^z\hat{\sigma}_{105}^z + 16\hat{\sigma}_{60}^z\hat{\sigma}_{104}^z + 16\hat{\sigma}_{73}^z\hat{\sigma}_{91}^z + 16\hat{\sigma}_{58}^z\hat{\sigma}_{107}^z + 16\hat{\sigma}_{59}^z\hat{\sigma}_{106}^z + 16\hat{\sigma}_{65}^z\hat{\sigma}_{102}^z + \\
& 16\hat{\sigma}_{66}^z\hat{\sigma}_{103}^z + 16\hat{\sigma}_{73}^z\hat{\sigma}_{96}^z + 16\hat{\sigma}_{65}^z\hat{\sigma}_{105}^z + 16\hat{\sigma}_{65}^z\hat{\sigma}_{107}^z + 16\hat{\sigma}_{66}^z\hat{\sigma}_{106}^z + 16\hat{\sigma}_{73}^z\hat{\sigma}_{102}^z + 16\hat{\sigma}_{73}^z\hat{\sigma}_{105}^z + 16\hat{\sigma}_{73}^z\hat{\sigma}_{107}^z + 64\hat{\sigma}_{86}^z\hat{\sigma}_{96}^z + \\
& 32\hat{\sigma}_{86}^z\hat{\sigma}_{102}^z + 32\hat{\sigma}_{87}^z\hat{\sigma}_{103}^z + 32\hat{\sigma}_{86}^z\hat{\sigma}_{105}^z + 32\hat{\sigma}_{88}^z\hat{\sigma}_{104}^z + 32\hat{\sigma}_{86}^z\hat{\sigma}_{107}^z + 32\hat{\sigma}_{87}^z\hat{\sigma}_{106}^z + 32\hat{\sigma}_{91}^z\hat{\sigma}_{102}^z + 32\hat{\sigma}_{92}^z\hat{\sigma}_{103}^z + 32\hat{\sigma}_{91}^z\hat{\sigma}_{105}^z + \\
& 32\hat{\sigma}_{91}^z\hat{\sigma}_{107}^z + 32\hat{\sigma}_{92}^z\hat{\sigma}_{106}^z + 32\hat{\sigma}_{96}^z\hat{\sigma}_{102}^z + 32\hat{\sigma}_{96}^z\hat{\sigma}_{105}^z + 32\hat{\sigma}_{96}^z\hat{\sigma}_{107}^z + 64\hat{\sigma}_{102}^z\hat{\sigma}_{107}^z + 4551232
\end{aligned}$$