

M = 4, n = 2:

Original equation:

$$\begin{aligned}
& +6f_{-1}^2f_0^2 + 4f_{-1}^3f_1 + 4f_{-2}f_0^3 + 24f_{-2}f_{-1}f_0f_1 + 12f_{-2}f_{-1}^2f_2 \\
& + 6f_{-2}^2f_1^2 + 12f_{-2}^2f_0f_2 + 12f_{-2}^2f_{-1}f_3 + 4f_{-2}^3f_4 \\
& + 12f_{-3}f_0^2f_1 + 12f_{-3}f_{-1}f_1^2 + 24f_{-3}f_{-1}f_0f_2 + 12f_{-3}f_{-1}^2f_3 \\
& + 24f_{-3}f_{-2}f_1f_2 + 24f_{-3}f_{-2}f_0f_3 + 24f_{-3}f_{-2}f_{-1}f_4 \\
& + 6f_{-3}^2f_2^2 + 12f_{-3}^2f_1f_3 + 12f_{-3}^2f_0f_4 + 12f_{-4}f_0f_1^2 \\
& + 12f_{-4}f_0^2f_2 + 24f_{-4}f_{-1}f_1f_2 + 24f_{-4}f_{-1}f_0f_3 + 12f_{-4}f_{-1}^2f_4 \\
& + 12f_{-4}f_{-2}f_2^2 + 24f_{-4}f_{-2}f_1f_3 + 24f_{-4}f_{-2}f_0f_4 \\
& + 24f_{-4}f_{-3}f_2f_3 + 24f_{-4}f_{-3}f_1f_4 + 6f_{-4}^2f_3^2 + 12f_{-4}^2f_2f_4 = 0
\end{aligned} \tag{1}$$

Equivalent equation, where $f_{-j} = \overline{f_j}$:

$$\begin{aligned}
& 4f_0^3\overline{f_2} + 12f_0^2f_1\overline{f_3} + 12f_0^2f_2\overline{f_4} + 6f_0^2\overline{f_1}^2 + 12f_0f_1^2\overline{f_4} \\
& + 24f_0f_1\overline{f_1f_2} + 24f_0f_2\overline{f_1f_3} + 12f_0f_2\overline{f_2}^2 + 24f_0f_3\overline{f_1f_4} \\
& + 24f_0f_3\overline{f_2f_3} + 24f_0f_4\overline{f_2f_4} + 12f_0f_4\overline{f_3}^2 + 12f_1^2\overline{f_1f_3} \\
& + 6f_1^2\overline{f_2}^2 + 24f_1f_2\overline{f_1f_4} + 24f_1f_2\overline{f_2f_3} + 24f_1f_3\overline{f_2f_4} \\
& + 12f_1f_3\overline{f_3}^2 + 24f_1f_4\overline{f_3f_4} + 4f_1\overline{f_1}^3 + 12f_2^2\overline{f_2f_4} + 6f_2^2\overline{f_3}^2 \\
& + 24f_2f_3\overline{f_3f_4} + 12f_2f_4\overline{f_4}^2 + 12f_2\overline{f_1}^2\overline{f_2} + 6f_3^2\overline{f_4}^2 + 12f_3\overline{f_1}^2\overline{f_3} \\
& + 12f_3\overline{f_1f_2}^2 + 12f_4\overline{f_1}^2\overline{f_4} + 24f_4\overline{f_1f_2f_3} + 4f_4\overline{f_2}^3 = 0
\end{aligned} \tag{2}$$

All possible solutions:

$$\{f_1 : 0, \quad f_2 : 0, \quad f_3 : 0\} \tag{3}$$

$$\{f_1 : 0, \quad f_2 : 0, \quad f_3 : 0\} \tag{4}$$

$$\{f_1 : 0, \quad f_2 : 0, \quad f_4 : 0\} \tag{5}$$

$$\{f_1 : 0, \quad f_2 : 0, \quad f_3 : 0, \quad f_4 : 0\} \tag{6}$$

Time elapsed: 2.372112512588501 seconds