M = 4, n = 1:

Original equation:

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

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

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

All possible solutions:

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

$$\{f_1:0,\quad f_2:0,\quad f_4:0\}\tag{4}$$

Time elapsed: 0.9448659420013428 seconds