$$
\begin{aligned}
\langle HF|h_i c_m a_a^\dagger a_b^\dagger a_d a_c c_o^\dagger h_k^\dagger|HF\rangle \;&=\; \langle HF|h_i c_m c_a^\dagger h_b c_d h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \;+\; \langle HF|h_i c_m c_a^\dagger h_b h_d^\dagger c_c c_o^\dagger h_k^\dagger|HF\rangle \\
&+\; \langle HF|h_i c_m h_a c_b^\dagger c_d h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \;+\; \langle HF|h_i c_m h_a c_b^\dagger h_d^\dagger c_c c_o^\dagger h_k^\dagger|HF\rangle \\
&+\; \langle HF|h_i c_m h_a h_b h_d^\dagger h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \qquad (1)
\end{aligned}
$$

$$
\begin{aligned}
&=\; \langle HF|h_i c_m c_a^\dagger h_b c_d h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \;+\; \langle HF|h_i c_m c_a^\dagger h_b c_d h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \\
&+\; \langle HF|h_i c_m c_a^\dagger h_b h_d^\dagger c_c c_o^\dagger h_k^\dagger|HF\rangle \;+\; \langle HF|h_i c_m c_a^\dagger h_b h_d^\dagger c_c c_o^\dagger h_k^\dagger|HF\rangle \\
&+\; \langle HF|h_i c_m h_a c_b^\dagger c_d h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \;+\; \langle HF|h_i c_m h_a c_b^\dagger c_d h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \\
&+\; \langle HF|h_i c_m h_a c_b^\dagger h_d^\dagger c_c c_o^\dagger h_k^\dagger|HF\rangle \;+\; \langle HF|h_i c_m h_a c_b^\dagger h_d^\dagger c_c c_o^\dagger h_k^\dagger|HF\rangle \\
&+\; \langle HF|h_i c_m h_a h_b h_d^\dagger h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \;+\; \langle HF|h_i c_m h_a h_b h_d^\dagger h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \\
&+\; \langle HF|h_i c_m h_a h_b h_d^\dagger h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \;+\; \langle HF|h_i c_m h_a h_b h_d^\dagger h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \\
&+\; \langle HF|h_i c_m h_a h_b h_d^\dagger h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \;+\; \langle HF|h_i c_m h_a h_b h_d^\dagger h_c^\dagger c_o^\dagger h_k^\dagger|HF\rangle \qquad (2)
\end{aligned}
$$

$$
\begin{aligned}
&=\; \delta_{ic}\Theta_{\epsilon_F\epsilon_i}\delta_{bk}\Theta_{\epsilon_F\epsilon_b}\delta_{ma}\Theta_{\epsilon_m\epsilon_F}\delta_{do}\Theta_{\epsilon_d\epsilon_F} \;+\; (-1)\delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{bc}\Theta_{\epsilon_F\epsilon_b}\delta_{ma}\Theta_{\epsilon_m\epsilon_F}\delta_{do}\Theta_{\epsilon_d\epsilon_F} \\
&+\; (-1)\delta_{id}\Theta_{\epsilon_F\epsilon_i}\delta_{bk}\Theta_{\epsilon_F\epsilon_b}\delta_{ma}\Theta_{\epsilon_m\epsilon_F}\delta_{co}\Theta_{\epsilon_c\epsilon_F} \;+\; \delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{bd}\Theta_{\epsilon_F\epsilon_b}\delta_{ma}\Theta_{\epsilon_m\epsilon_F}\delta_{co}\Theta_{\epsilon_c\epsilon_F} \\
&+\; (-1)\delta_{ic}\Theta_{\epsilon_F\epsilon_i}\delta_{ak}\Theta_{\epsilon_F\epsilon_a}\delta_{mb}\Theta_{\epsilon_m\epsilon_F}\delta_{do}\Theta_{\epsilon_d\epsilon_F} \;+\; \delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{ac}\Theta_{\epsilon_F\epsilon_a}\delta_{mb}\Theta_{\epsilon_m\epsilon_F}\delta_{do}\Theta_{\epsilon_d\epsilon_F} \\
&+\; \delta_{id}\Theta_{\epsilon_F\epsilon_i}\delta_{ak}\Theta_{\epsilon_F\epsilon_a}\delta_{mb}\Theta_{\epsilon_m\epsilon_F}\delta_{co}\Theta_{\epsilon_c\epsilon_F} \;+\; (-1)\delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{ad}\Theta_{\epsilon_F\epsilon_a}\delta_{mb}\Theta_{\epsilon_m\epsilon_F}\delta_{co}\Theta_{\epsilon_c\epsilon_F} \\
&+\; (-1)\delta_{id}\Theta_{\epsilon_F\epsilon_i}\delta_{ac}\Theta_{\epsilon_F\epsilon_a}\delta_{bk}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F} \;+\; \delta_{id}\Theta_{\epsilon_F\epsilon_i}\delta_{ak}\Theta_{\epsilon_F\epsilon_a}\delta_{bc}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F} \\
&+\; \delta_{ic}\Theta_{\epsilon_F\epsilon_i}\delta_{ad}\Theta_{\epsilon_F\epsilon_a}\delta_{bk}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F} \;+\; (-1)\delta_{ic}\Theta_{\epsilon_F\epsilon_i}\delta_{ak}\Theta_{\epsilon_F\epsilon_a}\delta_{bd}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F} \\
&+\; \delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{ac}\Theta_{\epsilon_F\epsilon_a}\delta_{bd}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F} \;+\; (-1)\delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{ad}\Theta_{\epsilon_F\epsilon_a}\delta_{bc}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F} \qquad (3)
\end{aligned}
$$