$$\langle HF|h_i c_m a_a^\dagger a_b^\dagger a_c a_d c_o^\dagger h_k^\dagger|HF\rangle = \langle HF|h_i c_m c_a^\dagger h_b c_c h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle + \langle HF|h_i c_m c_a^\dagger h_b h_c^\dagger c_d c_o^\dagger h_k^\dagger|HF\rangle$$

$$+ \langle HF|h_i c_m h_a c_b^\dagger c_c h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle + \langle HF|h_i c_m h_a c_b^\dagger h_c^\dagger c_d c_o^\dagger h_k^\dagger|HF\rangle$$

$$+ \langle HF|h_i c_m h_a h_b h_c^\dagger h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle \qquad (1)$$

$$= \langle HF|h_i c_m c_a^\dagger h_b c_c h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle + \langle HF|h_i c_m c_a^\dagger h_b c_c h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle$$

$$+ \langle HF|h_i c_m c_a^\dagger h_b h_c^\dagger c_d c_o^\dagger h_k^\dagger|HF\rangle + \langle HF|h_i c_m c_a^\dagger h_b h_c^\dagger c_d c_o^\dagger h_k^\dagger|HF\rangle$$

$$+ \langle HF|h_i c_m h_a c_b^\dagger c_c h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle + \langle HF|h_i c_m h_a c_b^\dagger c_c h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle$$

$$+ \langle HF|h_i c_m h_a c_b^\dagger h_c^\dagger c_d c_o^\dagger h_k^\dagger|HF\rangle + \langle HF|h_i c_m h_a c_b^\dagger h_c^\dagger c_d c_o^\dagger h_k^\dagger|HF\rangle$$

$$+ \langle HF|h_i c_m h_a h_b h_c^\dagger h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle + \langle HF|h_i c_m h_a h_b h_c^\dagger h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle$$

$$+ \langle HF|h_i c_m h_a h_b h_c^\dagger h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle + \langle HF|h_i c_m h_a h_b h_c^\dagger h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle$$

$$+ \langle HF|h_i c_m h_a h_b h_c^\dagger h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle + \langle HF|h_i c_m h_a h_b h_c^\dagger h_d^\dagger c_o^\dagger h_k^\dagger|HF\rangle \qquad (2)$$

$$= \delta_{id}\Theta_{\epsilon_F\epsilon_i}\delta_{bk}\Theta_{\epsilon_F\epsilon_b}\delta_{ma}\Theta_{\epsilon_m\epsilon_F}\delta_{co}\Theta_{\epsilon_c\epsilon_F} + (-1)\delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{bd}\Theta_{\epsilon_F\epsilon_b}\delta_{ma}\Theta_{\epsilon_m\epsilon_F}\delta_{co}\Theta_{\epsilon_c\epsilon_F}$$

$$+ (-1)\delta_{ic}\Theta_{\epsilon_F\epsilon_i}\delta_{bk}\Theta_{\epsilon_F\epsilon_b}\delta_{ma}\Theta_{\epsilon_m\epsilon_F}\delta_{do}\Theta_{\epsilon_d\epsilon_F} + \delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{bc}\Theta_{\epsilon_F\epsilon_b}\delta_{ma}\Theta_{\epsilon_m\epsilon_F}\delta_{do}\Theta_{\epsilon_d\epsilon_F}$$

$$+ (-1)\delta_{id}\Theta_{\epsilon_F\epsilon_i}\delta_{ak}\Theta_{\epsilon_F\epsilon_a}\delta_{mb}\Theta_{\epsilon_m\epsilon_F}\delta_{co}\Theta_{\epsilon_c\epsilon_F} + \delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{ad}\Theta_{\epsilon_F\epsilon_a}\delta_{mb}\Theta_{\epsilon_m\epsilon_F}\delta_{co}\Theta_{\epsilon_c\epsilon_F}$$

$$+ \delta_{ic}\Theta_{\epsilon_F\epsilon_i}\delta_{ak}\Theta_{\epsilon_F\epsilon_a}\delta_{mb}\Theta_{\epsilon_m\epsilon_F}\delta_{do}\Theta_{\epsilon_d\epsilon_F} + (-1)\delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{ac}\Theta_{\epsilon_F\epsilon_a}\delta_{mb}\Theta_{\epsilon_m\epsilon_F}\delta_{do}\Theta_{\epsilon_d\epsilon_F}$$

$$+ (-1)\delta_{ic}\Theta_{\epsilon_F\epsilon_i}\delta_{ad}\Theta_{\epsilon_F\epsilon_a}\delta_{bk}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F} + \delta_{ic}\Theta_{\epsilon_F\epsilon_i}\delta_{ak}\Theta_{\epsilon_F\epsilon_a}\delta_{bd}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F}$$

$$+ \delta_{id}\Theta_{\epsilon_F\epsilon_i}\delta_{ac}\Theta_{\epsilon_F\epsilon_a}\delta_{bk}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F} + (-1)\delta_{id}\Theta_{\epsilon_F\epsilon_i}\delta_{ak}\Theta_{\epsilon_F\epsilon_a}\delta_{bc}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F}$$

$$+ \delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{ad}\Theta_{\epsilon_F\epsilon_a}\delta_{bc}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F} + (-1)\delta_{ik}\Theta_{\epsilon_F\epsilon_i}\delta_{ac}\Theta_{\epsilon_F\epsilon_a}\delta_{bd}\Theta_{\epsilon_F\epsilon_b}\delta_{mo}\Theta_{\epsilon_m\epsilon_F} \qquad (3)$$