

$$\langle HF | a_a^\dagger a_b^\dagger a_c a_d c_m^\dagger h_i^\dagger c_o^\dagger h_k^\dagger | HF \rangle = \langle HF | h_a h_b c_c c_d c_m^\dagger h_i^\dagger c_o^\dagger h_k^\dagger | HF \rangle \quad (1)$$

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

$$+ \langle HF | h_a h_b c_c c_d c_m^\dagger h_i^\dagger c_o^\dagger h_k^\dagger | HF \rangle + \langle HF | h_a h_b c_c c_d c_m^\dagger h_i^\dagger c_o^\dagger h_k^\dagger | HF \rangle \quad (2)$$

$$= (-1) \delta_{ai} \Theta_{\epsilon_F \epsilon_a} \delta_{bk} \Theta_{\epsilon_F \epsilon_b} \delta_{cm} \Theta_{\epsilon_c \epsilon_F} \delta_{do} \Theta_{\epsilon_d \epsilon_F} + \delta_{ai} \Theta_{\epsilon_F \epsilon_a} \delta_{bk} \Theta_{\epsilon_F \epsilon_b} \delta_{co} \Theta_{\epsilon_c \epsilon_F} \delta_{dm} \Theta_{\epsilon_d \epsilon_F}$$

$$+ \delta_{ak} \Theta_{\epsilon_F \epsilon_a} \delta_{bi} \Theta_{\epsilon_F \epsilon_b} \delta_{cm} \Theta_{\epsilon_c \epsilon_F} \delta_{do} \Theta_{\epsilon_d \epsilon_F} + (-1) \delta_{ak} \Theta_{\epsilon_F \epsilon_a} \delta_{bi} \Theta_{\epsilon_F \epsilon_b} \delta_{co} \Theta_{\epsilon_c \epsilon_F} \delta_{dm} \Theta_{\epsilon_d \epsilon_F} \quad (3)$$