Question 1a (0.5 pts). Write down the CID Schrödinger equation.

Question 1b (1.5 pts). Project the CID Schrödinger equation on the left by $\langle\Phi|$ and $\langle\Phi_{ij}^{ab}|$ to obtain expressions for E_c and c_{ab}^{ij}.

Question 1c (5 pts). Use Wick's theorem to evaluate each matrix element obtained in part b. You do not have to convert the KM contraction dots into η's and γ's, nor do you have to expand the index antisymmetrizers $\hat{P}$. For example, an acceptable place to stop for your answer would be something like

$$\langle\Phi|\tilde{a}_b^j\tilde{a}_{rs}^{pq}\tilde{a}_i^a|\Phi\rangle = \hat{P}_{(r/s)}^{(p/q)}\tilde{a}_{a\bullet}^{j\circ\circ}\tilde{a}_{r\bullet\bullet s\circ\circ}^{p\circ q\bullet}\tilde{a}_{i\circ}^{a\bullet\bullet}$$

Question 2 (3 pts). Explain in your own words how perturbation theory works, as applied to the time-independent Schrodinger equation. Be sure to include a brief discussion of the following in your answer:

- the Hamiltonian
- λ
- The perturbation expansion

Question 3 (3 pts). Derive an expression for $\Phi_0^{(3)}$ by explicitly pulling out terms from the perturbation expansion using the resolvent formalism. Explain you steps.

Question 4 (2 pts). Derive $\Phi_0^{(4)}$ using the energy substitution trick.

Question 5 (2 pts). Derive an expression for $E_0^{(5)}$ using Löwdin's PT formalism.