

Answer in 1 or 2 sentences :

- 16. Give example for basis in Hilbert's space.
- 17. How does first order perturbed wave function in time independent case is approximated?
- 18. Give one example application for the theory of time dependent perturbation.
- 19. What is result of $[L_z, x]$? $+i\hbar y$
- 20. Give two examples for spin 'o' particle.

SECTION B — 5 × 6 = 30 marks)

Answer ALL the questions choosing either (a) or (b).

- 21. (a) Give the comparison between Heisenberg and Dirac (Interaction) picture.

Or

- (b) Obtain energy eigen values for one dimensional harmonic oscillator.

- 22. (a) Give the theory of WKB approximation.

Or

- (b) Obtain ground state energy of Helium atom by perturbation technique.

- 23. (a) Give the theory of adiabatic approximation and calculate transition probability.

Or

- (b) Discuss time dependent perturbation theory to potential scattering.

- 24. (a) Prove $J_z (J_{\pm} \psi_{jm}) = (m \pm 1) \hbar J_{\pm} \psi_{jm}$.

Or

- (b) Obtain matrices for J^2, J_x, J_y and J_z .

- 25. (a) Outline the properties of γ -matrices.

Or

- (b) Discuss the commutation relations of Dirac's matrices.