2. The most general solution for WKB approximation is given by

(a) $\psi = \frac{A}{\sqrt{P}} e^{\frac{i}{\hbar}\int\sqrt{2m(E-V)}} + \frac{B}{\sqrt{P}} e^{\frac{-i}{\hbar}\int\sqrt{2m(E-V)}}$

(b) $\psi = \frac{A}{\sqrt{P}} e^{\frac{-i}{\hbar}\int\sqrt{2m(E+V)}}$

(c) $\psi = \frac{A}{\sqrt{P}} e^{\frac{i}{\hbar}\int\sqrt{2m(E+V)}}$

(d) $\psi = \frac{A}{P} e^{\frac{i}{\hbar}\int 2(mE-mV)}$.

3. $[\hat{L}_z, x]$ is given by

(a) $\hbar y$ (b) $i\hbar y$

(c) L_x (d) $-i\hbar z$.

4. Transition probability per unit time

(a) $\tau = \frac{2\pi}{\hbar^2}\rho_s|H'_{sm}|^2$ (b) $\tau = \frac{2\pi}{\hbar}\rho_s|H'_{sm}|^2$

(c) $\tau = \frac{\hbar}{2\pi}\nabla^2|H'_{sm}|^2$ (d) $\tau = \frac{\hbar}{2\pi}\rho_s|H'_{sm}|^2$.

5. Dirac's spin matrix ξ_z is

(a) $\alpha_x\alpha_y$ (b) $i\alpha_z$

(c) $-i\alpha_x\alpha_y$ (d) $+i\alpha_x\alpha_y$.

6. If $\hat{\alpha} = x$, $\hat{\beta} = \frac{\partial}{\partial x}$, then what is the value of $\left[\hat{x}, \frac{\partial}{\partial x}\right]$?

7. What is the value of ground state energy of a Hydrogen molecule by variation method?

8. How does scattering cross section $\frac{d\sigma}{d\Omega}$ and scattering amplitude are related?

9. What is the eigen value for the operator $\hat{J}_z$?

10. Write down Klein–Gordan's relativistic equations.

SECTION B — (5 × 4 = 20 marks)

Answer ALL questions.

11. (a) Bring out the distinctions between Schrodinger picture and Heisenberg picture.

Or

(b) Explain bra and ket vectors.

12. (a) Give the meaning of degeneracy. Give an example for a four fold degeneracy.

Or

(b) Outline the principle of WKB approximation.