



Q.1. Give short answers to the following questions. (10x3=30)

- i.* How do you define term “Wave Function” in quantum mechanics. Write down its physical significance.
- ii.* Show that Hamiltonian operator and momentum operator commutes with each other.
- iii.* Explain any three postulates of quantum mechanics.
- iv.* Show that is an eigen function of an operator and determine eigen value if
- v.* Write down physical significance of position momentum uncertainty.
- vi.* What is zero-point energy? Calculate zero-point energy of one-dimensional harmonic oscillator.
- vii.* Consider two states
Find the value of ‘a’ so that and are orthogonal.
- viii.* State correspondence principle.
- ix.* Show that
- x.* Define ladder operator in quantum mechanics. Give their importance in any physical phenomenon.

Answer the following questions in detail.

Q2. (a). Derive equation of continuity and explain its physical significance in hydrodynamics system.

(b). If is normalized wave function. Find the expectation value of where $0 < x \leq 10$.
(5+5)

Q3. A particle of mass m and total energy $E > V_0$ strikes a potential step from left where
Calculate reflection and transmission coefficient. Also show that $R+T=1$ (10)

Q4. (a) Obtain eigen value of .

(b) Can z-component of angular momentum and azimuthal angle can be measured with precision at the same time. (6+4)