**ASSIGNMENT - III**

**Q1.** *A particle of mass ‘m’ and energy ‘E’ is moving along X-axis, under the action of potential energy ‘V’. Develop the Schrodinger’s time dependent wave equation for the particle. Discuss the above equation for a free particle.*

**Q2.** *Starting from Schrodinger’s time independent wave equation for a  particle moving within a one-dimensional rigid box of length L, derive an expression for normalized wave function. Show that the energy of the particle is quantised.*

**Q3.** *What is quantum mechanical tunneling? Write some examples of it.*

*(i) A beam of electrons are incident on a barrier of height 6.0 eV and 0.2 nm wide. Find the energy they have, if 1.0% of them are tunnel through the barrier.*

**Q4.** *Describe operators, eigen-functions and eigen-values in relation to quantum mechanics?*

*(i) write down the expression for linear momentum operator and energy operator in quatum mechanics.*

**Q5.** *What do you mean by the expectation value of a physical quantity? A particle limited to the x -axis has the wave function ψ = ax between x=0 and x= 1, ψ=0 elsewhere (a) Find the probability that the particle can be found between x=0.3 and x=0.5 (b) Find the expecation value of the particle's position.*

**Q6.** *Compare a three level laser system with a four level laser system with appropriate diagram and explain.*

**Q7.** *State different parts of the optical fiber.*

*(i) Why the refractive index of the core is higher than that of cladding?*

*(ii) If the numerical aperture of an optical fiber is 0.24413, find the acceptance angle for the fiber.*

**Q8.** *State Poynting theorem. Write the direction and S.I unit of Poynting vector.*

*(i) A laser source emits power at rate of 1000 W. Find the average value of poynting vector at a point 5m ahead of it.*