

UNIVERSITY OF HYDERABAD

School of Physics

Jan 2010 - Apr 2010
M.Sc. II-Semester

Quantum Mechanics-I

Time : 1hr
MM : 20

Tutorial-X : Time Development

- [1] A particle moves in one dimension in the infinite well

$$V(x) = \begin{cases} 0 & \text{for } 0 \leq x \leq L \\ \infty & \text{otherwise} \end{cases}$$

Find the wave function at time t , if the wave function at $t = 0$ is given by

(a) $\sin \frac{19\pi x}{L}$

(b) $u(x) = \sin \frac{3\pi x}{L} + 3 \sin \frac{\pi x}{L} + 5 \sin \frac{11\pi x}{L}$

(c) $u(x) = Ax(x - L)$

- [2] Find the wave function for a free particle at a time $t > 0$ if the wave function at time $t = 0$ is given by

$$\psi(x, t = 0) = \begin{cases} \frac{1}{\sqrt{L}} & \text{for } |x| \leq \frac{L}{2} \\ 0 & \text{for } |x| > \frac{L}{2} \end{cases}$$

- [3] If $\psi_1(\vec{r}, t)$ and $\psi_2(\vec{r}, t)$ are two solutions of the time dependent Schrodinger equation, show that

$$\int \psi_1^*(\vec{r}, t) \psi_2(\vec{r}, t) d^3r$$

is independent of time.