

Q.4) (A) Attempt any **ONE**. **(8)**

(i) State the Schrodinger's time dependent equation, for potential energy V as a function of x alone. Show that this equation by separation of variables reduces to Schrodinger's time independent equation.

(ii) Normalize the following wave function .

$$\Psi_n(x) = \sin \frac{n \pi x}{l} ; 0 < x < l , \text{ where } n \in \mathbb{I}$$

If the normalized wave function of an oscillator is given by

$$\Psi(x) = A y e^{-\frac{y^2}{2}} ; -\infty < y < +\infty$$

Find A .

(B) Using $\Psi = A e^{-\frac{i}{\hbar}(Et - px)}$, obtain expressions for momentum and energy operators. **(4)**

(C) What are eigen functions and eigen values? What is meant by degenerate and non-degenerate states? **(3)**
