KATWA COLLEGE

B.Sc 5th Sem Internal Assessment Examination-2019

Subject : Physics

Paper : CC-XI(H)

Time :30 minutes *FM-10*

Answer any five question:

a) Find the commutator $[\hat{A}, \hat{B}]$ where $\hat{A} = x^3$ and $\hat{B} = x\frac{d}{dx}$.

b) The operator $(x+\frac{d}{dx})$ has the eigen value α. Derive the correspondingeigenfunction.

c) i> A wave function $\Psi(\vec{r},t)$ is admissible if
(p) Ψ is single-valued and finite (q) Ψ is finite
(r)Ψ is single-valued (s) Ψ is finite and multivalue

ii> Which of the wave function is the solution of Schr*ödinger equestion*a

(p) A Sec(x) (q) A $\exp(-x^2)$ (r) A tan(x) (s) A $\exp(x^2)$

d) A plane wave is given by the wave function $\Psi(x)=Ae^{ikx}$ in one-dimension.Find the probability current density.

e) If $\Psi_1(x,t)$ and$\Psi_2(x,t)$ are both the solutions of Schr*ödinger's* wave equation for a given potential V(x,t), then show that $\Psi=a_1\Psi_1+a_2\Psi_2$ in which a_1 *and* a_2 are arbitrary constants is also a solution.

f) The wavefunction of a particle constraint to move along $x(-\infty<x<+\infty)$ at a certain instant is given by $\Psi(x)=Ae^{-\frac{x^2}{a^2}+ibx}$ [a,b are real constants]. Find the normalization constant A.

g) Find the expectation value of the momentum of a particle free to move in a one-dimensional space of zero potential from $x=-\infty$ to $+\infty$.