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NY—43—2023

FACULTY OF SCIENCE

M.Sc. (First Year) (Second Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

(New/CBCS Pattern)

PHYSICS

Paper—PH-201

(Quantum Mechanics)

(Wednesday, 6-12-2023)

Time : 10.00 a.m. to 1.00 p.m.

Time—3 Hours

Maximum Marks—75

N.B. :— (i) All questions are compulsory.

(ii) All questions carry equal marks.

1. Explain postulates of quantum mechanics in brief with examples. 15

Or

(a) Derive an expression for time independent Schrodinger equation.

(b) Write physical significance of wave function. 15

2. Find the eigen values of total angular momentum operator \hat{L}^2 and L_z . 15

Or

(a) Prove the following commutation relation :

(i) $[\hat{L}_x, \hat{L}_y] = i\hbar\hat{L}_z$

(ii) $[\hat{L}_x, \hat{L}_z] = i\hbar\hat{L}_y$

(b) Explain reflection invariance and parity. 15

P.T.O.

3. Explain WKB approximation for one-dimensional case and hence turning point.

15

Or

(a) Write degenerate case of time independent perturbation theory.

(b) Write application to excited state of variational method. 15

4. Write in brief scattering by perfectly rigid sphere and scattering by a square well potential. 15

Or

(a) Explain scattering by spherically symmetric potential.

(b) Derive an expression for total scattering cross-section. 15

5. Write short notes on any *three* (Each carries 5 marks): 15

(a) Completeness of eigen function

(b) Angular momentum and rotation

(c) The basic principle of variational principle

(d) The Born approximation.