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NA—22—2023

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

(CBCS/New Pattern)

PHYSICS

Paper-XII

(Quantum Mechanics)

(Thursday, 7-12-2023)

Time : 10.00 a.m. to 12.00 noon

Time—2 Hours

Maximum Marks—40

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

(ii) All symbols have their own usual meanings.

(iii) Given :

(a) Charge of electron (e) = 1.6×10^{-19} C

(b) Mass of electron (m) = 9.1×10^{-31} kg

(c) Planck's constant (h) = 6.6205×10^{-34} J.s.

1. What is probability current ? Show that :

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$$s = \frac{-i\hbar}{2m} \left[\Psi^* \frac{ip}{\hbar} \Psi + \Psi \frac{ip}{\hbar} \Psi^* \right].$$

Or

(a) Explain photoelectric effect in detail.

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(b) State De-Broglie hypothesis of matter waves and explain De-Broglie wave velocity.

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P.T.O.

WT

(2)

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2. Obtain Schrodinger wave equation for Hydrogen atom in spherical form using Cartesian coordinate and give the separation of radial part. 15

Or

- (a) Derive an experssion for energy of a particle in one-dimensional box. 8
- (b) Explain momentum quantitation for a particle in one-dimensional box. 7
3. Write short notes on (any *two*) : 10
- (a) Heisenberg's uncertainty principle
- (b) Eigen values and eigen function
- (c) Particle in one-dimensional box wave function
- (d) Magnetic quantum number.

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