BACHELOR OF SCIENCE (CBCS-2018 COURSE)
T. Y. B. Sc. Sem-V : WINTER- 2022
SUBJECT : PHYSICS : QUANTUM MECHANICS

Day : Friday

Time : 02:00 PM-05:00 PM

Date : 9/12/2022

W-18407-2022

Max. Marks : 60

N.B.

1) All questions are **COMPULSORY**.
2) Figures to the **RIGHT** indicate **FULL** marks.

Q 1. Attempt any **Two** of the following. (12)
- (a) Obtain Schrodinger's time independent equation from time dependent equation.
- (b) Show that $v_g = v_p + k \frac{dv_p}{dk}$.
- (c) Obtain Eigen value of energy for particle in three-dimensional rigid box.

Q 2. Attempt any **Two** of the following. (12)
- (a) Explain quantum mechanical motion of a particle through constant potential.
- (b) Define an operator. State the quantum mechanical operators.
- (c) Write a note on uncertainty principles. Give different forms of uncertainty relations.

Q 3. Attempt any **Two** of the following. (12)
- (a) Discuss potential barrier qualitatively for $E < V_0$.
- (b) Discuss the γ-ray microscope to illustrate uncertainty relation.
- (c) State and explain Ehrenfest's first theorems.

Q 4. Attempt any **Three** of the following. (12)
- (a) State four application of tunneling effect.
- (b) State Schrödinger's time dependent and time independent equation.
- (c) Write a short note on wave particle duality.
- (d) Show that the momentum operator $(-i\hbar \frac{\partial}{\partial x})$ is Hermitian.

Q 5. Attempt any **Four** of the following. (12)
- (a) Define parity and parity operator.
- (b) What is the de Broglie wavelength of neutron whose energy is 1 eV?
- (c) When does the function is said to be well behaved?
- (d) What is free particle?
- (e) State and explain quantum numbers.
- (f) Explain the term wave packet.

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