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M.Sc. II Semester (CBCS) Degree Examination,
September/October - 2022

PHYSICS

21PHY2C6L : Quantum Mechanics

Time : 3 Hours Maximum Marks : 70

Note : *Answer **any five** of the following questions with question no.**1 is Compulsory**. Each question carries **equal** marks.*

1. (a) Explain how the quantum theory establishes the Photoelectric phenomena. **5+9**

(b) Discuss Wein's Black body experimental observation and its classical approach.

2. (a) Illustrate the wave function in the different regions for a particle having energy E is incident on an infinite potential barrier. **5+9**

(b) Obtain the normalized Eigen functions and Eigen values for the particle in an infinite potential with a rigid wall for the value $n = 1$.

3. (a) Explain Hilbert space and observables. **5+9**

(b) Obtain the Eigen functions and Eigen values of an operator L^2.

4. (a) Explain the Matrix representation of wave function and an operator. **5+9**

(b) "A quantum mechanical problem can be formulated either in differential equation form or in matrix form". Justify the statement.

5. (a) Explain with the significance, the Briet Wigner formula for resonant cross section. **5+9**

(b) Obtain the scattering cross section by a central potential using partial wave analysis.

6. (a) Explain the general uncertainty relation. **5+9**

(b) Obtain the energy values of a rigid rotator.

7. (a) Using Born approximation, calculate the differential and total cross sections for scattering of a particle of mass m of the δ - function potential $V(r) = g\delta(r)$, where g is constant. **5+9**

(b) Obtain the solutions of the harmonic oscillator using a variation method.

P.T.O.

8. (a) Explain the variation of reflection and transmission coefficients with $\varepsilon = \left(\frac{E}{V_0}\right)$ for a rectangular potential barrier. **5+5+4**

(b) Explain Bra and Ket notations as a linear operator.

(c) Explain the Bohr-Sommerfeld quantum condition.

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