ED-601

M.Sc. 3rd Semester
Examination, March-April 2021

PHYSICS

Paper - I

Quantum Mechanics - II

Time : Three Hours] [*Maximum Marks* : 80

Note : Answer **all** questions. All questions carry equal marks.

Unit-I

1. Calculate Van der Waals interaction energy between two hydrogen molecules using variation method and hence find the upper limit on the interaction energy.

OR

Find the approximate solutions of W. K. B. approximation method. Derive connection formulae for W. K. B. approximation.

Unit-II

2. What is Green's function ? Deduce formal expression for scattering amplitude by Green's function method.

OR

Find an expression for scattering amplitude in terms of phase shift using the theory of partial wave analysis.

Unit-III

3. Explain first order time dependent perturbation theory and derive Fermi's Golden rule.

OR

Discuss absorption and induced emission. Derive the expression for Harmonic oscillator perturbation.

Unit-IV

4. Discuss the problems faced during the formulation of relativistic quantum mechanics. Hence solve Dirac's equation for free particles using alpha and beta matrices.

OR

Discuss the Lorentz covariance of Dirac equation and charge densities.

Unit-V

5. Explain the spin of the Dirac particles. Solve Dirac equation for a Dirac particle in electromagnetic fields.

OR

Find out the spin-orbit energy and discuss the negative energy state of an electron.

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