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) 91051 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER M.A./M.Sc./M.Com. DEGREE (REGULAR) EXAMINATION, NOVEMBER 2020

(CBCSS)

Physics

PHY 3C 09—QUANTUM MECHANICS—II

(2019 Syllabus Year)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each Section / Part.*
2. *The minimum number of questions to be attended from the Section / Part shall remain same.*
3. *There will be an overall ceiling for each Section / Part that is equivalent to maximum weightage of the Section / Part.*

Section A

Answer **all** *questions.*

Each question carries weightage 1.

1. Give the WK B wave function in a classical region. Explain its features.
2. What is intermediate field Zeeman effect ?
3. Give the general formulation of time independent perturbation theory.
4. Give the criteria for choosing the trial wave function for the first excited excited states for the Variational method.
5. What is electric dipole approximation ?
6. What is scattering amplitude and differential scattering cross section ? How are they related ?
7. Explain hole theory. State the hypotheses which form the basis of the hole theory.
8. What are the draw backs of Klein Gordon equation ?

(8 × 1 = 8 weightage)

Turn over

Section B

Answer any **two** *questions.*
Each question carries weightage 5.

9. Using time independent perturbation theory discuss Weak field and strong field Zeeman eff

10. Describe the WKB method with respect to connection formulae and apply it to find the function inside and outside of a potential well with no vertical walls.

11. Describe briefly the Time dependent perturbation theory and apply it to find the scattering section in the Born approximation.

12. Show that the Dirac particles have spin ½.

(2 × 5 = 10 weigh

Section C

Answer any **four** *questions.*
Each question carries weightage 3.

13. Apply time independent perturbation theory to find the exact wave function and energy of harmonic oscillator.

14. Apply variational method to find the ground state wave function and the ground state ene Helium atom.

15. Discuss the theory of constant perturbation and deduce Fermi-Golden rule.

16. Deduce the expression for scattering cross section by the method of partial wave expansi scattering by central potential.

17. For a square well potential show that the scattering cross section is independent of energ scattering angle.

18. Derive the expression for conserved current from Dirac equation.

19. From the relativistic expression for the Hamiltonian derive the Klein Gordon equation

(4 × 3 = 12 weigh