(041130102)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017

THIRD SEMESTER

Branch – Physics

Paper I — QUANTUM MECHANICS – I

Time : 3 Hours *Max. Marks : 70*

PART – A

Answer any FIVE questions. All questions carry equal marks.

(Marks : 5 × 4 marks = 20 marks)

1. Give an account of the basic postulates of Quantum Mechanics.

2. Write about the Dirac's Bra and Ket notations.

3. Discuss about the Pauli's spin matrices.

4. Define angular momentum and obtain its quantum mechanical operator.

5. Explain the Linear Stark effect in Hydrogen atom.

6. Discuss the variation method and apply it to the Helium atom?

7. Write a note on Greens function in scattering theory.

8. Explain the importance of optical theorem in scattering theory.

PART – B

Answer ONE question from each unit.

(Marks : 4 × 12.5 marks = 50 marks)

UNIT – I

9. Obtain the Eigen functions and Eigen values of a potential well AND explain the concept of boundary states.

Or

10. Discuss the operator representation of Harmonic oscillator and obtain the Eigen values and Eigen function of Harmonic oscillator by using matrix method.

[P.T.O]

UNIT – II

11. Define the angular momentum operator L^2, L_+ and L_- and explain the commutation relation for angular momentum.

Or

12. What are Clebsch-Gordon coefficients and obtain the Clebsch-Gordon coefficients for system with $J_1 = 1/2$ and $J_2 = 1/2$

UNIT – III

13. Explain time dependent perturbation method and describe the effect of an harmonicity on solution of Harmonic oscillator problem.

Or

14. Calculate the transmission probability of a particle through a potential well with the help of WKB method.

UNIT – IV

15. Discuss the particle wave analysis of the scattering phenomena and obtain expression for the scattering amplitude.

Or

16. Describe Born-approximation method and explain when it is valid and what is the importance of Born-approximation in scattering theory.
