



Code No. : **300**

**FACULTY OF SCIENCE**  
**M.Sc. I Semester Examination, Nov./Dec. 2012**  
**PHYSICS/APPLIED ELECTRONICS**  
**Paper – III : (Quantum Mechanics – I)**

Time: 3 Hours]

[Max. Marks: 80

**Note** : Answer **all** questions from Part – A and Part – B. Each question carries **4** marks in Part – A and **12** marks in Part – B.

PART – A

(8×4=32 Marks)

**(Short Answer Type)**

1. Write about commuting and non-commuting operators.
2. Explain parity operator.
3. Write about interaction picture.
4. Discuss the raising and lowering operators.
5. Explain the unitary operators of space and time.
6. Write a note on spin zero and non-zero spin particles.
7. What do you understand by addition of angular momentum ?
8. Write the properties of Pauli's spin matrices.

PART – B

(4×12=48 Marks)

**(Essay Answer Type)**

9. a) What are Hermitian operators ? Discuss their properties.

OR

- b) State and explain Dirac Bra and Ket notation. Discuss its use in quantum mechanics.



10. a) Derive the equations of motion under Schrodinger and Heisenberg picture.

OR

b) Obtain eigen values and eigen functions of linear harmonic oscillator.

11. a) Discuss the generators of infinitesimal rotations.

OR

b) Write about time reversal and anti-linear operators.

12. a) How do you represent orbital angular momentum operator ? Discuss the importance of spin angular momentum.

OR

b) Derive the Clebsch-Gordon coefficients for  $j_1 = \frac{1}{2}$ ,  $j_2 = \frac{1}{2}$ .

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