St. Joseph's College of Arts & Science (Autonomous)
Cuddalore – 607001

PG & RESEARCH DEPARTMENT OF PHSYSICS
SUBJECT : Optics and Spectroscopy
SUBJECT CODE: PPH909
STAFF INCHARGE: Mr. K. Elayakumar

SECTION – A

1. Define transition probability
2. What do you mean by perturbation?
3. Define scattering cross section. Give its unit.
4. Explain Yukawa potential
5. What are symmetric wave functions?
6. Classify fermions with examples.
7. Define spontaneous emission.
8. Explain selection rule.
9. Define Hamiltonian.
10. Explain creation operator.
11. Define perturbation.
12. Explain schrodingers picture.
13. What it a frame of reference?
14. Define spin angular momentum.
15. Differentiate bosons and fermions with examples.
16. Explain induced emission.
17. Give the selection rule for transitions
18. Describe a quantum field.
19. Define an operator with examples.

SECTION – B

1. State and prove Fermi golden rule of transition to the continuum.
2. Write a note on the interaction picture.
3. Give the relation between angles in lab frames and CM frames.
4. Give the theory of partial wave analysis.
5. Give the physical significance of pauli's exclusion principle
6. Derive the hartee-fock equation
7. Give the semi classical theory of induced emission.
8. Explain the allowed and forbidden transitions of an electric dipole
9. Discuss the Lagrangian formulation of fields.
10. Explain the quantization of Schrödinger field.

11. Explain the harmonic perturbation.
12. Write a note on the heisenberg's interaction picture.
13. Obtain the relation between the scattering angles in lab and center of mass frames.
14. Deduce Rutherford's scattering formula from Born approximation.
15. Explain construction of symmetric and anti-symmetric wave functions.
16. Give the semi classical theory of spontaneous emission.
17. Explain the allowed and forbidden transitions of an electric dipole.
18. Discuss the Hamiltonian of charge particle in an electromagnetic field.
19. Write a note on the creation and annihilation operators.

SECTION – B

1. Give an account of the adiabatic approximation.
2. Using born approximation derive the scattering cross section by a square well potential.
3. Discuss in detail the differential scattering cross section due to collision of identical particles.
4. Derive the Einstein's coefficients for induced and spontaneous emissions.
5. Explain the quantization of Schrödinger field.
6. Explain i) Schrödinger ii) Heisenberg's picture
7. Describe the second quantization of Klein Gordon field.