



- b. Explain the concept of Yukawa potential and determine the formula for scattering cross section. (08)
- c. Briefly explain the Born series. (02)

OR

- Q-3 a. Starting with the Fourier transform of Green's function (14)  

$$G(r) = \frac{1}{(2\pi)^3} \int e^{is \cdot r} g(s) d^3s$$
, solve the integrals using Cauchy's integral formula and derive the formula for Green's function for Helmholtz Equation.

### SECTION – II

- Q-4 **Attempt the Following questions :** (07)
- State the Equipartition Theorem.
  - Which type of magnetic materials is best explained using Ising model?
  - State the De Haas Van Alphen Effect.
  - Why Helium gas is preferred to understand the Bose Einstein Condensation?
  - Name the two statistics that follow quantum mechanics.
  - Name the two parameters which lead an ideal Bose gas towards Bose Einstein condensation.
  - Define a Canonical Ensemble.

- Q-5 **Attempt all questions** (14)
- Derive the formula for the entropy of a perfect gas in a micro canonical ensemble. (07)
  - Derive the formula for Maxwell Boltzmann distribution of velocity for a canonical ensemble. (07)

OR

- Q-5 a. Define a grand canonical ensemble and derive the complete normalized formula for the distribution function of such an ensemble. (08)
- b. State and prove the Virial theorem. (06)

- Q-6 **Attempt all questions** (14)
- Explain the Bose-Einstein condensation using an ideal Bose gas. (12)  
Give the experimental proof of the same.
  - State the postulates of the Density matrix. (02)

OR

- Q-6 **Attempt all Questions**
- Explain what you understand by an ideal Fermi gas. Highlight the properties exhibited by such gases. (07)
  - Explain the concept of Ising model. How is the one dimensional Ising model different from the general form? (07)

