6. (*a*) Explain Born approximation and discuss the evaluation of coulomb and screened coulomb potentials.

Or

(*b*) Discuss the method of partial wave analysis for scattering theory and derive the total scattering cross section at low energy by a hard sphere.

M.Sc.—Phy-IIS (204)

2019

Time : 3 hours

Full Marks : 80

Answer from **both** the Sections as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(QUANTUM MECHANICS-II)

SECTION – A

1. Answer any *four* of the following : 4 × 4

(*a*) Obtain the energy eigen values for hydrogen atom.

(*b*) Explain linear stark effect.

(*c*) Explain the degeneracy in the spectra.

(*d*) Explain Fermi's Golden rule.

(*e*) Explain optical theorem.

(*f*) Write a short note on coulomb end exchange interactions.

Or

2. Answer *all* questions : 2 × 8

(*a*) Define degeneracy in the spectra.

(*b*) Obtain eigen functions for hydrogen atom.

(*c*) Define linear stark effect.

(*d*) What do you mean by perturbation ?

(*e*) Define cold emission.

(*f*) Define screened coulomb potential.

(*g*) What are exchange interaction ?

(*h*) Define scattering cross section.

SECTION – B

Answer **all** questions : 16 × 4

3. (*a*) Obtain radial equation and explain the reduction to equivalent one body problem.

Or

(*b*) Explain radial probability distribution and obtain on expression of plane waves interms of spherical waves.

4. (*a*) Briefly explain the stationary perturbation theory and discuss the Rayligh Schrödinger method for non-degenerate systems.

Or

(*b*) Explain the removal of degeneracy and discuss the normal Zeeman effect.

5. (*a*) Discuss the time dependent perturbation theory and apply to an atom exposed to Harmonic perturbation.

Or

(*b*) Explain variation method and evaluate the energy levels of ground state of He atom.