14. (a) Distinguish between spontaneous emission and induced emission.

Or

(b) Explain the term density matrix.

15. (a) Obtain Lagrange equation for classical field.

Or

(b) What are creation, destruction and number operators?

SECTION C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Obtain an expression for the scattering amplitude in terms of Green's function.

Or

(b) Discuss fully the method of partial waves for scattering.

17. (a) Give an account of Hartree's self consistent field (S.C.F) method.

Or

(b) Discuss the doublet separation in alkali spectra.

18. (a) Give an account of the theory of hydrogen molecule ion and obtain expressions for symmetric and anti-symmetric energy states.

Or

(b) Explain briefly hybridisation of atomic orbitals with an example.

19. (a) Obtain Einstein's transition probability coefficients for induced emission and absorption.

Or

(b) Discuss the interaction of an atom with electromagnetic radiation and find the expression for transition probability.

20. (a) Deduce quantum field equations.

Or

(b) Describe fully quantization of non-relativistic Schroedinger equation.