SECTION B — (5 × 4 = 20 marks)

11. (a) Obtain the expression for the external field of a dielectric medium.

Or

(b) Write a note on the volume forces in the electrostatic field.

12. (a) Derive the equation of continuity.

Or

(b) Write a brief note on antenna arrays.

13. (a) Explain propagation of EM waves in free space.

Or

(b) Explain Brewster's law and degrees of polarisation.

14. (a) Define differential scattering cross-section and total scattering cross-section.

Or

(b) Explain coherence and incoherence in scattered light.

15. (a) Write down the covariance and tensor form of Maxwell's equations.

Or

(b) Explain the covariance of electro-magnetic field tensor.

SECTION C — (5 × 8 = 40 marks)

16. (a) Derive expressions for the potential and field due to a polarised sphere.

Or

(b) State and prove Thomson's theorem.

17. (a) Derive Maxwell's equations in electromagnetic potentials.

Or

(b) Derive expressions for the electric and magnetic field components in the near and far zones due to an oscillating electric dipole.

18. (a) Discuss the propagation of plane EM waves in

(i) isotropic dielectric and

(ii) anisotropic dielectric.

Or

(b) Explain reflection from a metallic surface. Write a note on cavity resonator.

19. (a) Discuss normal dispersion in liquids and solids.

Or

(b) Give a detailed account of scattering by a free electron and obtain the Thomson scattering cross section formula.