

13. (a) Prove that for a glass interface ($n_1 = 1.5$ and $n_2 = 1.0$) for normal incidence the reflection and transmission coefficients are 0.04 and 0.96 respectively.

Or

(b) What is meant by Total internal reflection?

14. (a) What is meant by resonant scattering?

Or

(b) Why red light is used for danger signals?

15. (a) What are the postulates of theory of relativity?

Or

(b) Define Lorentz force law.

SECTION C — ($5 \times 8 = 40$ marks)

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

16. (a) Derive Clausius - Mossotti relation.

Or

(b) Show that the cavity definition for the electric field inside dielectric depends on the shape of the cavity.

17. (a) Derive the equation of continuity.

Or

(b) Deduce Poynting theorem from Maxwell's relations.

18. (a) Explain the reflection and refraction at the boundary of two non-conducting media.

Or

(b) What must be the width of a rectangular guide such that the energy of electromagnetic radiations whose free space wavelength is 3 cm. travels down the guide at 95% of the speed of light.

19. (a) Derive expression for Thomson scattering of a free electron.

Or

(b) Derive expression for Rayleigh's scattering cross section for a bound electron.

20. (a) Find the component of wave four vector, show that its square is zero.

Or

(b) Show that the self product of electromagnetic field Tensor is given by $F_{\mu\nu}^2 = 2 \left(B^2 - \frac{E^2}{C^2} \right)$.