

(b) Define the electromagnetic field four tensor and write its components explicitly. Show how they can be used to write the Maxwell's equations in covariant form.

27. (a) Derive an expression for Thomson Cross-section in terms of classical electromagnetic radius of the charge.

Or

(b) What is normal and anomalous dispersion? Derive Sellmeier's equation for the refractive index of a dielectric medium.

28. (a) Derive the equations of Telegraphy.

Or

(b) Discuss the phenomenon of total internal reflection on the basis of electromagnetic theory.

29. (a) In a parallel plate capacitor, show that the rate at which energy flow into the capacitor from the surrounding space is equal to the rate at which the stored electric energy increases.

$$(i.e.) P = \pi r^2 h \epsilon_0 E \frac{\partial E}{\partial t}$$

Or

(b) Show that

(i) The momentum of charged particle in an electromagnetic field is given by

$$P = mV + A.$$

(ii) The Lagrangian function of the charged particle in an electromagnetic field is given by

$$L = \frac{1}{2}mV^2 - q(\phi - V.A).$$

30. (a) Calculate the scalar and vector functions which characterise the electric field of a dipole of moment P at a position r .

Or

(b) Derive an expression for the magnetic vector potential and verify whether it satisfies Poisson's equation.

Handwritten notes:
 $\frac{1}{4\pi\epsilon_0} \frac{q}{r^2}$
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