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FACULTY OF SCIENCE

M.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

PHYSICS

(PH-15)

(Electrodynamics)

(Tuesday, 10-12-2024)   **Time : 2.00 p.m. to 5.00 p.m.**

Time—3 Hours   *Maximum Marks—75*

N.B. :— (*i*) *All* questions are compulsory.

      (*ii*) Figures to the right indicate full marks.

1. State Maxwell's equations for the system of charges and currents. Obtain the Poynting's theorem for the conservation of energy in an electromagnetic fields.

                  15

Or

(*a*) Derive an expression for the equation of continuity.   8

(*b*) Obtain Maxwell's equations in terms of scalar and vector potential using Coulomb gauge for potential.   7

P.T.O.

2.   Derive Frensel's equation for reselection and refraction of electromagnetic waves at a plane boundary separating two media.   15

Or

(a)   Discuss the phenomenon of total internal reflection on the basis of electromagnetic theory.   8

(b)   Derive expression for the guide wavelength of TE mode propagating in rectangular wave guide.   7

3.   Derive expressions for the field radiated by an accelerated charged particle at low velocity.   15

Or

(a)   Obtain expressions for the Lienard-Wiechert potential of a uniform moving point charge.   8

(b)   Define antenna. Discuss the radiation pattern given by an array by a available wavelength example.   7

4.   Define the elctromagnetic field tensor. Write Maxwell's equation in the covariant form and the transformation properties of fields under Lorentz transformation.

15

Or

(*a*) Explain in detail length contraction and time dilation. 8

(*b*) Write Maxwell's equations in 4-vector form and prove that they are invariant under Lorentz transformations. 7

5. Write short notes on (any *three*) : 15

(*a*) Concept Radiation Pressure

(*b*) Brewster angle

(*c*) Electric dipole radiation

(*d*) 4-vector in electrodynamics.