

C162

Total Pages : 3

Roll No.

MSCPH-508

Electrodynamics

M.Sc. Physics (MSCPH)

2nd Semester Examination, 2022 (June)

Time : 2 Hours]

Max. Marks : 80

Note : This paper is of Eighty (80) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION-A

(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Twenty (20) marks each. Learners are required to answer any Two (02) questions only.

(2×20=40)

1. A square containing loop with sides of length L rotates so that the angle between the normal to the plane of loop and a fixed magnetic field B varies as $\theta = \theta(t) + \theta_0 \left(\frac{t}{t_0} \right)$ find the emf induced in the loop.

2. Derive electromagnetic equation in conducting medium. Explain depth of penetration and propagation constant.
3. Write short notes on :
 - (a) Larmor's formula.
 - (b) Bremsstrahlung and Cerenkov radiation.
 - (c) Lienard Wiechert potential
 - (d) Displacement current.
4. Establish the covariant form of Maxwell's electromagnetic field equations by four vectors. Does it represent the covariant formulation of electrodynamics.
5. Derive an expression for the attenuation constant and phase constant of a transmission line in terms of the constants R, L, G and C.

SECTION-B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Ten (10) marks each. Learners are required to answer any Four (04) questions only. (4×10=40)

1. Derive continuity equation, starting from Maxwell's equation.
2. Explain Ampere's circuital law. Give its significance. Derive its differential form.

3. Derive Lorentz gauge condition.
4. Establish relationship among the three vectors D, E, P which is : $D = \epsilon_0 E + P$ (ϵ_0 is a constant, the permittivity of a vacuum).
5. Explain retentivity and coercivity. Draw HYSTERESIS curve.
6. Using Maxwell equations $\text{curl } E = -\frac{dB}{dt}$

$$\text{curl } H = J + \frac{dD}{dt}$$

Show that

$$\text{div } B = 0 \text{ and } \text{div } D = \rho$$

7. Derive equation of continuity. What are physical significances of it ?
8. If an electron is accelerated in synchrotron with energy 5 BeV in a radius of 10 meter, calculate the power radiated by the electron and energy loss per unit turn.

