

32034

M. Sc. 3rd Sem. Physics (New)
(Regular/Re-appear/Improvement)
Examination – December-2023

ELECTRODYNAMICS AND WAVE PROPAGATION

Paper : PHY-302

Time : Three Hours] [Maximum Marks : 80

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) What are gauge transformations ?
- (b) What is monopole antenna and dipole antenna ?
- (c) Distinguish between normal and anomalous dispersion.
- (d) Differentiate between characteristic impedance and line impedance 4 × 4 = 16

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UNIT – I

2. (a) Express Maxwell's field equations in tensor form and thereby define electromagnetic field tensor. How does this information lead to the covariance of the theory ? 10
- (b) Show that $C^2 B^2 - E^2$ is invariant under Lorentz's transformation. 6
3. Define *four* current and *four* vector potentials. How electric & magnetic fields are combined to form the various components of electromagnetic field tensor ? Hence derive the transformation of E & B fields. 16

UNIT – II

4. Discuss the electromagnetic field produced by uniformly moving charge. How does Biot's Savart Law follow magnetic field equation ? Does such charge not give an impression of virtual photon ? 16
5. (a) Derive the Lienard-radiation formula for relativistic charge particle where velocity and acceleration are perpendicular. 12
- (b) How Bremsstrahlung radiation differ from Cherenkov radiation ? 4

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UNIT – III

6. Discuss the motion of charged particle in uniform E & B fields. 16
7. (a) Derive an equation of continuity for time varying field. 8
- (b) What is dispersion ? Discuss dispersion in case of gaseous medium having both real and complex refractive index. 8

UNIT – IV

8. Derive an expression for the field of TE mode in case of rectangular wave guide. 16
9. (a) On what factors does the input impedance of a transmission line depend ? 6
- (b) Derive the transmission line equations. 10

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