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Name

Reg. No.

FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, NOVEMBER 2024

(CBCSS)

Physics

PHY 1C 03—ELECTRODYNAMICS AND PLASMA PHYSICS

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

Section A

8 Short questions answerable within 7.5 minutes

Answer all questions, each question carries weightage 1.

1. Write down Faraday's law with amperes correction.
2. Define polarization current.
3. What is the significance of plasma frequency?
4. Define plane of incidence.
5. Define reflection co-efficient and transmission co-efficient.
6. Define plasma parameter.
7. Define Transverse electro magnetic wave.
8. What is micro-strip lines?

(8 × 1 = 8 weightage)

Section B

4 essay questions answerable within 30 minutes.

Answer any two questions, each question carries weightage 5.

9. Analyze the behaviour of transverse magnetic waves allow uniform guiding structures.
10. Write down Maxwell's equations in medium. Explain the relevance of the equations.
11. Explain the general transformation rules in electromagnetic fields to obtain rules of transformations.

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12. Explain group velocity, face velocity and derive the relation connecting them. Answer any two conditions for no dispersion, normal dispersion and anomalous dispersion. (2 x 5 = 10)

Section C

7 problems answerable within 15 minutes.

Answer any **four** questions, each question carries weightage 3.

13. Explain how a changing electric field induces a magnetic field.
14. The permittivity of water at optical frequencies is $1.75\epsilon_0$. It is found that an isotropic light at distance d under water yields an illuminated circular area of a radius 5 m. determine d .
15. The electric field intensity of a linearly polarized uniform plane wave propagating in the z direction is in seawater is $E_x = 100 \cos(10^7 \pi t)$ (V/m) at $Z = 0$. the constitutive parameters of seawater are $\epsilon_r = 72$, $\mu_r = 1$ and $\sigma = 4$ (S/m). Determine the attenuation constant, phase constant, intrinsic impedance, phase velocity, wavelength and skin depth (Problem).
16. Calculate Debye length of a collection of plasma at temperature 1000C contains $n = 4 \times 10^6 \text{ m}^{-3}$.
17. Compute the density (unit m^{-3}) of an ideal gas under the following conditions a) 0°C and 1 Torr = 1 mm of HG) pressure b) In vacuum at 10^{-3} Torr pressure and Temp = 20°C .
18. Explain boundary conditions of electrodynamics.
19. What is field Tensor ? Explain.

(4 x 3 = 12)