

C 32342

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Name.....

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2017

(CUCSS)

Physics

PHY 1C 03—ELECTRODYNAMICS AND PLASMA PHYSICS

(2012 Admissions)

Time : Three Hours

Maximum : 36 Weightage

Section A

Answer all questions.

Each question carries a weightage of 1.

1. What are harmonic fields ?
2. Explain potential functions.
3. Explain skin depth.
4. What are loss less media ?
5. Give the boundary conditions for \vec{D} and \vec{B} .
6. What is a rectangular waveguide ?
7. Explain transmission lines.
8. Discuss the magnetic field due to a moving point charge.
9. Explain Debye shielding.
10. What are Vlasov equations ?
11. What are polar and nonpolar dielectrics ?
12. Define four vectors.

(12 × 1 = 12 weightage)

Section B

Answer any two questions.

Each question carries a weightage of 6.

13. What are Maxwell's dynamic equations. Arrive at the electromagnetic boundary conditions.
14. Discuss the oblique incidence of electromagnetic wave at a plane dielectric boundary.

Turn over

15. Discuss the electrodynamics in tensor notation.
16. Describe the theoretical treatment of motion of charged particle in an electromagnetic field.

(2 × 6 = 12 weightage)

Section C

Answer any four questions.

Each carries a weightage of 3.

17. A wave from free space strikes a lossless water surface ($\epsilon_r = 80$) at an angle of 30° from the normal. Evaluate the angle of reflection and refraction.
18. Energy from a 2000 Watt lamp is radiated uniformly. Evaluate the average intensities of electric and magnetic field of radiation at a distance 4 m from the lamp.
19. Calculate the plasma frequency and maximum penetration depth for a plasma density of 10^{20} electrons/m².
20. A rectangular waveguide has breadth 20 cm. Find the wavelength for a signal frequency of 3 GHz for the dominant mode
21. Prove that $E^2 - c^2 B^2$ is a Lorentz scalar
22. Show that for a charged particle moving with velocity \vec{v} , the magnetic potential is given by

$$\vec{A} = \frac{\vec{v}}{c^2} V, \text{ where } V \text{ is the electrostatic potential.}$$

(4 × 3 = 12 weightage)