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D 72896 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2014

(CUCSS)

Physics

PHY 1C 03—ELECTRODYNAMICS AND PLASMA PHYSICS

(2012 admission onwards)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*
Each carries 1 *weightage.*

1. Explain polarization of e.m. waves.
2. Show that the e.m. wave propagate in a dielectric medium with a velocity $V = \frac{1}{\sqrt{\mu \varepsilon}}$.
3. Explain, why the definition of poynting vector is not a mandatory one.
4. What is Maxwell stress tensor ?
5. Write down Maxwell's equation in differential form and give their physical meaning.
6. How are the scalar and vector potential related to the electric and magnetic field ?
7. Explain how do cavity resonators resemble with electronic resonant circuits.
8. Discuss the phenomenon of radiation from an oscillating dipole.
9. With suitable example, explain symmetric tensor and antisymmetric tensor.
10. Prove that continuity equation follow from Maxwell's equation.
11. For an Alfven wave show that time averaged ion kinetic energy/cm^3 is equal to the magnetic wave energy.
12. What is Debye shielding ? Give its significance.

(12 × 1 = 12 weightage)

Section B

Answer any **two** *questions.*
Each carries 6 *weightage.*

13. Deduce Maxwell's equation of electromagnetic field and discuss it. Comment on the correspondence of the field B and H with E and D.
14. Discuss the reflection and transmission of e.m. wave at normal incidence at dielectric interface. Explain the relation connecting reflection coefficient and transmission coefficient.

Turn over

15. What are the difference, in the propagation and general behaviour, between TE and TM modes rectangular waveguides ? Describe briefly the various methods of exciting waveguides.

16. With suitable example, explain the advantages of electrodynamics in tensor notation and formul Maxwell's equations interms of tensors.

(2 × 6 = 12 weighta

Section C

Answer any **four** *questions.*
Each carries 3 *weightage.*

17. Show that for a plane electromagnetic wave poynting vector is 'C' times energy density of the fi

18. A straight wire along z-axis carries a charge density λ travelling in the + Z direction at spee Construct the field tensor and dual tensor at the point $(x, 0)$.

19. Assuming that the electric vector of an e.m. wave is $E = E \cdot e^{-1}(wt - kr)$. Prove the various lav reflection and refraction.

20. Prove that for glass-air interface ($n_2 = 1.5$ and $n_1 = 1.0$) for normal incidence of e.m. wave reflection and transmission coefficients are 0.04 and 0.96 respectively.

21. If a charge q is at the origin of a system S, calculate the electric fields as observed by an obse in another frame S' at the instant the two origins coincide if S' is moving with uniform vel 'v' along z-axis.

22. Prove that for a plasma wave $V_p V_g = C^2$, when the letters have usual meaning.

(4 × 3 = 12 weigh