(6 pages) **Reg. No. :** .....

Code No. : 9379 **Sub. Code : HPHM 22**

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2015.

Second Semester

Physics

ELECTROMAGNETIC THEORY

(For those who joined in July 2012 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The ———— law says about the force experienced between two stationary electric charge.

   (a) Faradays (b) Coloumbs

   (c) Bio-savart (d) Magnetic force.

2. The dielectric constant for water is ————

   (a) 1 (b) 80.1

   (c) 99 (d) 5.7

3. The Lorentz law is given by

   (a) $E_{mag} = Q(\vec{V}.\vec{B})$ (b) $\vec{P}_{mag} = \frac{(\vec{V}\times\vec{B})}{Q}$

   (c) $\vec{F}_{mag} = Q(\vec{V}\times\vec{B})$ (d) $\vec{F}_{mag} = \frac{\vec{V}.\vec{B}}{Q}$.

4. The unit of magnetic dipole moments are

   (a) ampere (b) ampere meter^2

   (c) ampere meter (d) ampere/meter.

5. The differential form of the Faraday's law is

   (a) $\nabla.\vec{E} = \frac{-\partial\vec{B}}{\partial t}$ (b) $\vec{\nabla}\times\vec{E} = \frac{-\partial\vec{B}}{\partial t}$

   (c) $\vec{\nabla}\times\vec{E} = \frac{-1}{\mu_0}\frac{\partial\vec{B}}{\partial t}$ (d) $\vec{\nabla}.\vec{E} = \frac{-1}{\mu_0}\frac{\partial\vec{B}}{\partial t}$.

6. The Ampere's law with Maxwell's correction is

   (a) $\vec{\nabla}\times\vec{B} = \mu_0\vec{J}$

   (b) $\vec{\nabla}\times\vec{B} = \frac{\vec{J}}{\mu_0}$

   (c) $\vec{\nabla}\times\vec{B} = \mu_0\vec{J} + \mu_0\varepsilon_0\frac{\partial\vec{E}}{\partial t}$

   (d) $\vec{\nabla}.\vec{B} = \frac{1}{\mu_0}\vec{J}$.

7. When an em wave is passing through free space both $\vec{E}$ and H vectors are

(a) not in phase

(b) in phase

(c) out of phase

(d) 90° out of phase.

8. A wave guide is used for the propagation of

(a) Radio waves (b) Micro waves

(c) IR (d) UV.

9. Larmor formula gives the

(a) Total power radiated

(b) Radiation reaction force

(c) Dipole radiation

(d) Poynting vector.

10. The blueness of the sky is due to the dependence of power on

(a) w^2 (b) $w^3\rho^2$

(c) ρ^3 (d) w^4.

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Find the electric field a distance z above the midpoint of a straight line segment of length $2L$ which carriers a uniform line charge λ.

Or

(b) Discuss about induced dipoles and atomic polarizability.

12. (a) Determine the multiple expansion of the vector potential.

Or

(b) Show the relationship between magnetic susceptibility and permeability in linear media.

13. (a) Obtain Maxwell's equation in differential form.

Or

(b) State and prove Poynting's theorem.

14. (a) Obtain the electrodynamic boundary conditions for $\vec{E}$ and $\vec{B}$ in linear media.

Or

(b) Describe the propagation of em waves in the coaxial transmission line.

15. (a) Derive an expression for the power radiated by a moving point charge.

Or

(b) Explain what is diople radiation. Discuss electric dipole radiation with approximation.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Obtain Gauss's law in differential form.

Or

(b) Discuss and derive the relation between susceptibility, permittivity and dielectric constant of linear dielectrics.

17. (a) Derive Ampere's law from Biot-Savart law.

Or

(b) Explain in detail about ferromagnetism with neat diagram.

18. (a) Obtain the expression for magnetic field energy and electric field energy.

Or

(b) Explain how Lorentz gauge $\vec{V}$ and $\vec{A}$ satisfy the inhomogeneous wave equation.

19. (a) Determine reflection and transmission co-efficients at oblique incidence.

Or

(b) Explain what is wave guides. Derive the expression for EM waves in conductors wave guides.

20. (a) Obtain the Lienard-Wiechert potentials for a moving point charge.

Or

(b) Obtain the expression for the power and energy radiated by an oscillating electric dipole.

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