Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University) Coimbatore-641043.

Master's Degree Examination – November 2018
III Semester

Class : II PG **Time: 3 hours**
Major : Physics **Max. Marks: 60**

17MPHC13- Electromagnetic Theory and Electrodynamics

Part A **10 x 1/2 = 5**

Choose the correct answer

1. ----------theorem states that Laplace's equation satisfying boundary conditions have one and only one solution

   a. Greens b. Uniqueness c. Gauss d. Poynting

2. The energy density of electrostatic field in free space is given by

   a. ½ ($\varepsilon_0 E^2$) b. ½ (εE^2) c. ½ ($\varepsilon_0 D$) d. ½ ($\varepsilon_0 D^2$)

3. Magnetic dipole moment per unit volume is known as

   a. magnetic intensity b. magnetic potential c. magnetization d .magnetisation current

4. The degree to which the lines of force can penetrate the specimen is represented by

   a. magnetic susceptibility b. magnetic permeability c. magnetic field d. magnetic intensity

5. The differential form of Faraday's law is

   a. Curl E = $-\frac{\partial B}{\partial t}$ b. Curl E = $-\frac{\partial \varphi}{\partial t}$ c. e = $-\frac{\partial B}{\partial t}$ d. Div E = $-\frac{\partial B}{\partial t}$

6. The amount of field energy passing through unit area of the surface in a direction perpendicular to the plane containing E and H per unit time is

   a. energy density b. current density c. displacement current d. poynting vector

7. The angle of incidence for which angle of transmission becomes 90° is called

   a. polarising angle b. Prewster angle c. critical angle d. glacing angle

8. Snell's law is given by

   a. $\frac{\sin\theta_i}{\sin\theta_T} = \frac{n_1}{n_2}$ b. $\frac{\sin\theta_i}{\sin\theta_T} = \frac{n_2}{n_1}$ c. $\frac{\sin\theta_T}{\sin\theta_i} = \frac{n_2}{n_1}$ d. $\frac{\sin\theta_i}{\sin\theta_T} = n$

9. The power radiated by an electric dipole is proportional to

   a. (frequency)^2 b. (frequency)^4 c. (wavelength)^4 d. (wavelength)^2

10. The force exerted back on the charge by radiation is called

    a. radiated power b. radiation damping c. radiation resistance d. oscillating dipole

Part B 5 x 4 = 20

Answer ALL questions

Each answer should not exceed 200 words or one page

11.a. Outline briefly multipole expansion of electric fields. (Or)

11.b. What are polar and non-polar molecules? Explain dielectric polarisation

12.a. Explain magnetic vector potential and its importance in magnetostatics. (Or)

12.b. What is meant by a magnetic circuit? Discuss its applications.

13.a. Discuss the significance of displacement current. (Or)

13.b. Explain non-uniqueness of electromagnetic potentials .

14.a. Discuss the importance of Brewster angle in polarising the electromagnetic waves. (Or)

14.b. Describe the phenomenon of total internal reflection and critical angle.

15.a. Obtain the expressions for Lienard – Wiechert potentials. (Or)

15.b. Explain the radiation emitted from a half wave antenna.

Part C 5 x 7 = 35

Answer ALL questions

Each answer should not exceed 600 words or three pages

16.a. State and explain Gauss law of electrostatics. Deduce Poisson's and Laplace's equation.

(Or)

16.b. Derive Clausius Mossotti relation for non-polar molecules.

17.a. State Biot-Savart law and from this deduce Ampere's circuital law for steady currents.

(Or)

17.b. What is hysteresis? Derive an expression for energy dissipated in a hysteresis cycle.

18.a. Derive Maxwell's equations of electromagnetic field and explain their physical significance.

(Or)

18.b. What are Gauge transformations? Discuss about Lorentz gauge.

19.a. Obtain the boundary conditions for the four electromagnetic field vectors at the interface between two media.

(Or)

19.b. Describe the propagation of plane electromagnetic waves in conducting media.

20.a. Derive the expression for power radiated by an oscillating electric dipole.

(Or)

20.b. Obtain the expressions for electric and magnetic fields of a uniformly moving point charge.

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