Register Number……

B.E. DEGREE EXAMINATIONS: NOVEMBER 2009

Fourth semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U07EC403: Electromagnetic Fields

Time: Three Hours **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (10 x 1 = 10 Marks)

1. $\vec{A}$ is solenoidal if _____.

   a) $\nabla \times \vec{A} = 0$ b) $\nabla \cdot \vec{A} = 0$ c) $\nabla^2 \vec{A} = 0$ d) $\nabla \times \vec{A} = 1$

2. Differential volume in Spherical co-ordinate system is given by _____.

   a) dv = rdrdϕdz b) dv = drdϕdz c) dv = r^2sinθdrdθdϕ d) dv = dxdydz

3. The _____ is defined as the tangential force times the radial distance at which it acts.

   a. Magnetic flux density b. Magnetic Energy density c. Torque d. Magnetic moment

4. If $\vec{A}$ is vector magnetic potential, then _____.

   a) $\nabla \times \vec{A} = 0$ b) $\nabla \times \vec{A} = \vec{H}$ c) $\nabla \times \vec{A} = 1$ d) $\nabla \times \vec{A} = \vec{B}$

5. The product of number of turns and the flux linking them is called _____.

   a) Flux linkage b) Magnetic flux density c) Flux density d) Field density

6. Magnetic dipole moment per unit volume is called as _____.

   a) Permittivity b) Magnetization c) Permeability d) Polarization

7. The ratio of displacement current to the cross sectional area of plates of capacitor is called__.

   a) Conduction current density b) Displacement current density

   c) Displacement current d) Total Current density

8. Velocity of propagation for the wave motion in current free, charge free dielectric is given as_____.

   a) $V = \mu_0 \varepsilon_0$ b) $V = \frac{1}{\mu_0 \varepsilon_0}$ c) $V = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$ d) $V = \sqrt{\mu_0 \varepsilon_0}$

9. Point form of Maxwell's second equation is obtained from _____.

   a) Ampere's circuital law b) Gauss' law c) Faraday's law d) Coulombs law

10. Loss tangent is given as

    a) $\frac{\sigma}{\omega\varepsilon}$ b) $\frac{\omega\varepsilon}{\sigma}$ c) $\frac{\sigma\varepsilon}{\omega}$ d) $\frac{\sigma\omega}{\varepsilon}$

PART B (10 x 2 = 20 Marks)

11. State Stoke's theorem.

12. Define electric flux and flux density.

13. State Biot- savart's law.
14. Define Magnetic moment.
15. State the boundary conditions at the interface between two perfect dielectrics.
16. Define Magnetization.
17. State Faraday's law.
18. Write down the Maxwell's equation for free spaces in point form.
19. Define depth of penetration.
20. Calculate the characteristic impedance of free space.

PART C (5 x 14 = 70 Marks)

21. a) Find the Electric field intensity due to charges distributed uniformly on an infinite charged sheet.

(OR)

b) i) State and explain coulomb's law. (4)

ii) From Gauss law find the $\vec{D}$ and $\vec{E}$ for infinite line charge. (10)

22. a) State Ampere's circuital law and explain any one of its applications.

(OR)

b) Derive an expression for magnetic field intensity at any point on the rectangular loop carrying a current I.

23. a) Derive the boundary conditions for magnetic field.

(OR)

b) i) Calculate the inductance of a 10m length of coaxial cable filled with a material for which μ_r = 80 and radii of inner and outer conductors are 1mm and 4mm respectively. (6)

ii) Derive Poisson's and Laplace equation. (8)

24. a) Explain about poynting vector and poynting theorem.

(OR)

b) Derive the Maxwell's equations in both point and integral forms.

25. a) Derive the Electromagnetic wave equation in free space.

(OR)

b) i) Define Polarization. What are the different types of wave polarization? Explain them with mathematical expressions. (8)

ii) Explain the phenomena of total internal reflection and derive the expression for critical angle. (6)

****