Register Number: ……

**B.E. DEGREE EXAMINATIONS: NOV/DEC 2010**

Third Semester

**ELCTRONICS AND COMMUNICATION ENGINEERING**

ECE104: Electromagnetic Fields

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

**Answer ALL Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. Differential volume in Cylindrical co-ordinate system is

   a) dv = dr dφ dz b) dv = dx dy dz

   c) dv = r dr dφ dz d) dv = $r^2 \sin\theta$ dr dθ dφ.

2. The force per unit charge is defined as

   a) electric field b) electric field intensity

   c) magnetic field d) flux density.

3. In a magnetic field, the direction of force is _____ to the direction of velocity and magnetic flux density.

   a) perpendicular b) parallel c) horizontal d) inverse

4. The divergence of the curl of any vector field is

   a) 1 b) 0 c) ∞ d) finite.

5. If $C_1$ = 100mF and $C_2$ = 50mF, Calculate the energy stored with a steady applied potential difference of 1000V in each case.

   a) 6.66kJ b) 666.6kJ c) 66.66kJ d) 6.66J.

6. The boundary condition between perfect dielectrics is that the tangential component of electric flux density is _____ across the boundary.

   a) continuous b) zero c) unity d) non-continuous.

7. $\nabla.\overline{B}=0$ is the point form of Maxwell's equation for

   a) Dynamic field b) static field c) time-varying field d) magnetic field.

8. $\left|\frac{J_c}{J_d}\right|$ is given by

   a) σωε b) σ/ωε c) ω/εσ d) ε/σω

9. Free space intrinsic impedance is equal to

   a) 307.4Ω b) 317.4Ω c) 377Ω d) 347Ω

10. The skin depth is defined as the depth in which the wave has been attenuated by the amount approximately _____ of its initial value.

a) $\frac{1}{\sqrt{2}}$ % b) $\sqrt{2}$ % c) 50% d) 37%.

**PART – B (10 X 2 = 20 Marks)**

11. State Coulomb's law.
12. Find the electric potential at a point (8, 6) m due to a charge of $10^{-9}$ C located at the origin in free space.
13. State Biot-Savart law.
14. Define Magnetic Torque.
15. Write the expression for Poisson's and Laplace equation.
16. Differentiate Self Inductance and Mutual Inductance.
17. Define Faraday's law.
18. What is conduction current density and write its expression?
19. Write the expressions for the Wave equation in free space of both electric and magnetic fields.
20. Define Brewster angle.

**PART – C (5 X 14 = 70 Marks)**

21. a) Derive the expression for electric field due to infinite line charge. **(OR)**

b) (i) State and prove Gauss Law. (7)

(ii) From Gauss law find the $\vec{D}$ and $\vec{E}$ for infinite sheet of charge having charge density $\rho_s$ lying in XY plane. (7)

22. a) Applying Ampere's Circuital law, find the magnetic field intensity due to a co-axial cable and also draw the variation of $\vec{H}$ against r in co-axial cable.

**(OR)**

b) (i) Derive the Lorentz force equation for a moving charge. (7)

(ii) Derive the expression for the force between two parallel wires carrying current in the same direction. (7)

23. a) Derive the boundary conditions of magnetic field at the interface of two different media.

**(OR)**

b) (i)Derive the point form of Ohm's Law. (7)

(ii) Derive the continuity equation for current. (7)

24. a) Derive the Maxwell's equation in integral and in point form. **(OR)**

b) (i)State and prove Poynting theorem. (7)

(ii)Derive the expression for the power flow in a co-axial cable. (7)

25. a) Derive the wave equations for the conducting medium. **(OR)**

b) Derive the expression for reflection coefficient with parallel polarization if the wave is incident obliquely on a perfect dielectric.

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