ANNA UNIVERSITY COIMBATORE

B.E. / B.Tech. DEGREE EXAMINATIONS - DECEMBER 2008

THIRD SEMESTER – ELECTRONICS & COMMUNICATION ENGINEERING

EC 305 – ELECTROMAGNETIC FIELDS

Time: Three Hours   Maximum: 100 Marks

PART A – (20 x 2 = 40 Marks)

Answer ALL Questions

1. State the application of gauss law?

2. Transform the vector $B = y\, a_x - x\, a_y + z\, a_z$ in to cylindrical co-ordinates.

3. State the principle of superposition with respect to Electric field.

4. Give the transformations of scalar co-ordinates from the spherical to rectangular co-ordinate.

5. Define magnetic moment

6. Give Maxwell's four equations for static electric field and steady magnetic fields.

7. What is meant by a conservative field?

8. State Lorentz force equation.

9. Define Hysteresis.

10. Give the classification of materials based on the magnetic characteristics.

11. Determine whether the potential field $V = x^2 - y^2 + z^2$ satisfy the laplace equation.

12. Define Inductance.

13. Write ampere's circuital law in integral form.

14. State faraday's law.

15. Define Poynting vector.

16. State snell's law.

17. Explain skin depth.

18. What is Brewster angle?

19. Define Polarization.

20. List the properties of a uniform plane wave?

PART - B (5 × 12 = 60 Marks)

Answer Any FIVE Questions

21. (i) Find the total Charge inside a volume with volume charge density $\rho_v = 10\, z^2 e^{-0.1x} \sin \pi y$ where $-1 \le x \le 2$, $0 \le y \le 1$, $3 \le z \le 3.6$ (7)

 (ii) Determine Electric field intensity at P(1,2,5) due to a point charge of 10 nc at Q (1,-2,3). (5)

22. (i) State Divergence Theorem. (2)

 (ii) Determine the electric field intensity of an infinitely long, straight, line charge of a uniform density ρ_λ in air. (10)

23. (i) An air core toroid has a mean radius of 40mm and is wound with 4000 turns of wire. The circular cross section of the toroid has a radius of 4mm. A current of 10A is passed in the wire. Find the Inductance and the energy stored. (7)

 (ii) Calculate the inductance of a 10m long co-axial cable filled with a material for which $\mu_r = 80$ and radii of inner and outer conductors are 1mm and 4 mm respectively. (5)

24. Derive Maxwell's generalized four equations in integral form and convert it to differential form. (12)

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25. State and prove poynting theorem with their physical interpretation. (12)

26. A lossy dielectric is characterized by $\varepsilon_r = 2.5$, $\mu_r = 4$ and $\sigma = 10^{-3}$ mho/m at a frequency of 10 MHz. find (12)
    (i) Attenuation constant,
    (ii) Phase constant
    (iii) Velocity of propagation
    (iv) Intrinsic Impedance.

27. (i) State Biot – Savart's law in vector form. (4)
    (ii) Obtain the expression for magnetic field intensity due to a circular loop of wire carrying a current I, placed with its centre at origin. (8)

28. (i) Derive wave equation for E and H in a conducting medium. (7)
    (ii) Write briefly on total internal reflection. (5)

******THE END******

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