ANNA UNIVERSITY COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : SEPTEMBER 2009

REGULATIONS – 2007

THIRD SEMESTER : ELECTRICAL & ELECTRONICS ENGINEERING

070280010 - ELECTROMAGNETIC THEORY

TIME : 3 Hours                                             Max.Marks : 100

PART – A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1.    Prove that $\Delta. \Delta \times H = 0$.

2.    Transform the cartesian co-ordinates x=2, y=1 and z=3 into spherical co-ordinates.

3.    State coulomb's law.

4.    What is the electric field intensity at a distance of 20cm from a charge of 2μc in vacuum?

5.    Define potential and potential difference.

6.    State Gauss's law for electric field.

7.    Find the electric potential at a point (4,3)m due to a charge of $10^{-9}$C located at the origin in free space.

8.    Define dipole and dipole moment.

9.    A parallel plate capacitor with d=1m and plate area 0.8m$^2$ and a dielectric relative permittivity of 2.8. A dc volt of 500V is applied between the plates. Find the capacitance and energy stored.

10.   Write the point form of continuity equation for current.

11.   Give Poisson's equation.

12.   For a conductor the conductivity is σ=3.82 x $10^7$s/m and the mobility of electrons $\mu_e$=0.0014m$^2$/v$_s$. If the drift velocity is 5.3 x $10^{-4}$m/s,find the current density and electric field intensity.

13.   Define mutual inductance and coupling coefficient.

14.   State Ampere's circuit law.

15.   State the magnetic boundary conditions.

16.   Determine the force per unit length between two long parallel wires separated by 5cm in air and carrying currents of 40A in the same direction.

17.   Compare electric and magnetic circuits.

18.   Write down Maxwell's equations derived from Faraday's law.

19.   Define skin depth.

20.   Define Poynting vector.

PART – B

(5 x 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21.   (a) Discuss about electric field intensity due to surface charge distribution.          6

      (b) What are the different coordinate systems used to represent field vectors?          6
          Discuss them in brief.

22.   (a) State and prove Gauss's law?                                                          6

      (b) State and prove divergence theorem?                                                  6

23.   Explain the boundary conditions at the interface of a conductor and a dielectric

24. (a) Determine the capacitance of a capacitor consisting of two parallel plates 6
30cm x 30cm, surface area, separated by 5mm in air. What is the total
energy stored by the capacitor if the capacitors are charged to a PD of
500v.What is energy density?

(b) Derive continuity equation for current. 6

25. (a) Explain Biot-Savart's law. 6

(b) Derive magnetic flux density and field intensity at any point along the axis of 6
circular coil. ,

26. (a) Derive an expression for the inductance of solenoid and toroid. 8

(b) What is scalar and vector magnetic potential. Derive the necessary 4
expression.

27. Derive the differential and integral forms of Maxwell's equations.

28. (a) A normally incident electric field has amplitude E=1v/m in free space just 6
outside the sea water in which $\varepsilon_r$ = 80, $\mu_r$ =1, $\sigma$ =2.5 s/m. For a frequency of
30 Mhz at what depth the amplitude of E be 1 mv/m.

(b) Derive the electro magnetic wave equations. 6

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