ANNA UNIVERSITY COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : MAY / JUNE 2010

REGULATIONS : 2007

THIRD SEMESTER : ELECTRONICS & COMMUNICATION ENGINEERING

070280012 - ELECTROMAGNETIC FIELDS

TIME : 3 Hours   Max.Marks : 100

PART - A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. State divergence theorem.

2. Write the expression for vector going from point $A_1(2,3,1)$ to point A_2 (-2,1,4) in Cartesian co-ordinates. Also find out the length of this line.

3. State coulomb's law.

4. Define Gauss's law for different charge distribution.

5. Determine the potential difference between the points 'a' and 'b' which are at a distance of 0.5m and 0.1m respectively from a negative charge of $20*10^{-10}$ oulombs. $\epsilon_o = 8.854 pF/m$.

6. Define Biot Savart's law.

7. Find the total current in a circular conductor of radius 4mm if the current density varies according to $J = (10^4/r)\, a_z\, A/m^2$

8. Define Gauss's law for the magnetic fields.

9. State boundary conditions for two different dielectric medium.

10. Write the equation in point form for ohm's law.

11. Find the inductance per unit length of the coaxial cable. It is having a=2mm and b=4mm. Assume a free space medium and unit internal inductance.

12. Define the term magnetization.

13. State Faraday's law.

14. Write the Maxwell's four equations in point form.

15. State pointing theorem.

16. The magnetic field intensity in free space is given as $H = H_0 \sin \sqsubset a_y. A/m$ where and β is a constant quantity. Determine the displacement current density.

17. What is polarization? What are the types?

18. Define Brewster angle.

19. Electric field of uniform plane wave is given by $E = 40 \sin(30\pi*10^6 t - 2\pi z)a_x + 40 \cos(30\pi*10^6 t - 2\pi z)a_y$ V/m. Find i)Frequency of operation ii)wavelength.

20. Define depth of penetration.

PART – B

(5 x 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21.   a). Develop the electric field e at any general point p due to uniformly   (8) distributed charge along an infinite straight line. assume the charge density to be ρ_r and use Coulomb's law.

b). The three points in cartesian co-ordinate system are A(-1,3,2) , B(2,5,-4)   (4) and C(-1,3,3). Find out the following

   i) $\overline{AB}$

   ii) $\overline{CA}$

22.   a). Find the magnetic flux density at a point on the axis of a circular loop of   (8) radius 'b' that carries a direct current I.

22. b).A current carrying conductor is in the form (4)
$x^2+y^2=r^2$ at z=0 plane carrying current I in direction. Find out the expression
for H at : i)(0,0,h) ii)0,0,0)

23. a).Deduce an expression for a joint capacitance of two capacitors C_1 and C_2 (6)
in series and parallel.

b).Derive the inductance of a solenoid. (6)

24. a).State and prove Poynting theorem. (8)

b).Explain Poisson and Laplace Equation. (4)

25. a).A plane one GHz travelling wave in air with peak electric field of 1V/m is (6)
incident normally on a large copper sheet. Fine the average power absorbed
by sheet per sq.meter of area. For copper $\mu_r=\epsilon_r=1$ and $\sigma =58*10^6$ mho/m.

b).Derive wave propagation through a conducting medium (6)

26. a).A point p is expressed in the cylindrical co-ordinate system as p(3,π/4,2). (6)
Express this point in cartesian co-ordinate system.

b).Proove that the divergence of electric field and that of electric flux density (6)
in a charge free region is zero.

27. a).Derive the expression for torque on a loop carrying current I. (6)

b).Write short note on magnetic boundary condition. (6)

28. a).Explain the Faraday's law of electromagnetic induction. (6)

b).The magnetic field intensity of uniform plane wave in air is 20A/m in a_y (6)
direction.The wave is propogating in the a_z direction at a frequency of $2*10^9$
rad/sec.find wavelength.

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