ANNA UNIVERSITY – 2006
B.E/B.TECH IV SEMESTER DEGREE EXAMINATION
ELECTROMAGANETIC THEORY
(ELECTRONICS AND INSTRUMENTATION ENGINEERING)

TIME-3HOUR
MARK-100

ANSWER ALL QUESTIONS

PART A (10 ´ 2 = 20)

1. Two conducting spheres carry equal charges. The distance between the spheres is small compared to the radius of the spheres. In which case the absolute value of the force of interaction between the spheres be greater, when they carry like charges or when they carry unlike charges.

2. Compare the electrical field due to infinite line and infinite plane source.

3. Explain why the divergence of is zero.

4. Derive Poisson's equation for Magnetostatic field problem.

5. Derive an expression for loss tangent and mention the practical significance.

6. Express Electric field interim of electric and magnetic potential and explain the same.

7. In free space calculate and sketch and at .

8. How does frequency changes the behaviour of material from dielectric to conductor?

9. Formulate the problem for checking the insulation strength of a 11 kV coaxial cable.

10. Mention the types of boundary conditions in defining a Electromagnetic field problem.

PART B (5 ´ 16 = 80)

11. Derive the transmission and reflection coefficients in electromagnetic waves.
A travelling field in free space strikes a partially conducting medium with , Ms/m. Give a frequency of 500 MHz and V/m, determine .

12. (a) The electric field just above the surface of a charged drum of the photocopying machine has a magnitude of N/C. What is the surface charge density on the drum if it is a conductor. Derive the formula used.

                        Or

(b) Two electrically insulated plates of area 1.0 m2 are 3 mm apart and have equal and opposite charges of 10 . Neglecting any fringing effects of the field at the edges of the plate, find the force between the plates due to their electrical charge when the space between the plates is filled with air.

13. (a) Devine magnetic boundary conditions at the interface of two media. The interface between two different regions is normal to z axis (Cartesian coordinates). If (43.5 ax + 24.0az) and (22.0 ax + 24.0 az). What is the ratio of the relative permeability.

                        Or

(b) Two long parallel linear conductor carry 100 A and 200 A. If the conductor are separated by 20 mm, what the magnetic force per unit length on a conductor in the currents flow in the

(i) same direction
(ii) opposite direction.

14. (a) Derive the depth of penetration and explain its significance.If distilled water has at 1.0 GHz, calculate :

(i) the depth of penetration at 1 GHz
(ii) the 1% depth of penetration
(iii) the depth where the field is almost zero.

<div align="center">Or</div>

(b) Explain how and when electromagnetic waves are generated and propagated. Discuss on the direction of propagation, attenuation, surge impedance through air (free space), dielectric and conductor.

15. (a) Derive the finite difference equations for a electrostatic problem.
Calculate the potential at point P in the following configuration.

<div align="center">Or</div>

(b) Define and solve the following problem by direct integration method. Find the potential function and the electric field intensity for the region between the parallel plate capacitor.