Reg. No. : | | | | | | | | | | | |

Question Paper Code : R 3676

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Third Semester

Electrical and Electronics Engineering

EE 231 — ELECTROMAGNETIC THEORY

(Regulation 2001)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Electric field intensity.

2. Under what conditions will the field intensity be solenoidal and irrotational?

3. A conducting triangular loop carries a current of 10A. Find H at (0,0,5).

4. State Laplace's equation.

5. State Ampere's law.

6. Define magnetic dipole and magnetic dipole moment.

7. Define a wave.

8. For a lossless medium $\epsilon_r = 20$ and $\mu = 10$. Find the velocity of the plane wave.

9. What is conformal transformation? Give one application.

10. State the concept of method of images.

PART B — (5 × 16 = 80 marks)

11. (a) (i) State Gauss law for electric field. Derive its integral and differential forms. (6)

(ii) Derive the expression for the potential at a point P,h metres above a circular disc to σ_e / m^2. Hence deduce the potential at the centre of the disc. (10)

Or

(b) (i) Given the potential $V = \frac{10 \sin \theta \cos \phi}{r^2}$ find the electric flux density D at $(2, \pi/2, 0)$. (10)

(ii) If the volume charge density of a given charge distribution is given by $\rho = \rho_0 (\alpha / r) C/m^3$ in spherical coordinates $\rho = 0$ for r>R. Determine E at r<R. (6)

12. (a) (i) Derive the expression for the magnetic field intensity due to a circular current loop. (8)

(ii) Determine the magnetic field intensity due to a solenoid. (8)

Or

(b) (i) State Ampere's circuital law and Biot Savart's law. (6)

(ii) Explain the boundary conditions between two magnetic media. (10)

13. (a) Derive the Maxwells equations in point form and integral form. (16)

Or

(b) (i) A straight conductor of length 40 cm moves perpendicularly to its axis at a velocity of 50 m/s in a uniform magnetic field of flux density 1.2 T. Estimate the emf induced in the conductor if the direction of motion is
- normal to the field.
-parallel to the field. (10)

(ii) Discuss the relation between field theory and circuit theory in a simple series circuit. (6)

14. (a) Define Poynting vector and deduce the Poynting's theorem. (16)

Or

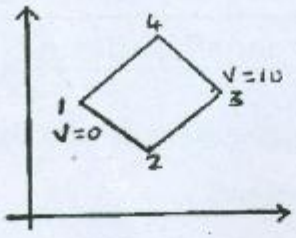
(b) (i) Write short notes on :

(1) Uniform plane waves. (4)

(2) Skin Effect. (4)

(ii) Derive the electromagnetic wave equation. (8)

15. (a) Consider the two elemental mesh shown in fig. Using finite elemental method determine the potentials within the mesh. (16)



Node	(x , y)
1	(0.8,1.8)
2	(1.4,1.4)
3	(2.1,2.1)
4	(1.2,2.7)

Or

(b) (i) Explain the Finite difference method to find potential at a point in a charge free medium. (10)

(ii) Explain about variable separable method. (6)