[06 – 2110]

II/IV B.E. DEGREE EXAMINATION.

First Semester

Electrical and Electronics Engineering

ELECTROMAGNETICS

(Common with Dual Degree Programme in EEE)

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR questions from the remaining.

All questions carry equal marks.

1. (a) Define Gauss law in integral form.

(b) What is polarization of dielectric?

(c) What is vector magnetic potential?

(d) Define Faraday's laws of electromagnetics.

(e) What is perfect dielectric? Give an example.

(f) Define energy store in magnetic field.

(g) Write a note on method of images.

2. (a) Define electric potential. Derive an expression for electrical potential at a point p which 'x' distance from a plate with charge q. Assume suitable dimensions.

(b) Find electric filed density in the region about a uniforms line charge of 8 nC/m lying along the z-axis in free space.

3. (a) Derive the expression for energy density in the electrostatic fields.

(b) A co-axial conductor has radii a = 0.8 mm and b = 3 mm and Polystyrene dielectric for which $\epsilon_R = 2.56$. If $P = \frac{2}{\rho} a_\rho$ nC/m^2 in the dielectric find

(i) D and E as function of 'ρ'

(ii) V_{ab} and χ_e.

(iii) If there are 4×10^{19} molecule/cubic meter in the dielectric, find $P(\rho)$.

4. (a) State and explain Biot-Savarts law with relative expressions.

(b) A solid conductor of a circular cross section is made of a homogenine non-magnetic material. If the radii is 2 mm, the conductor axis lies on the z-axis and the total current in the a_z direction is 20 A.

Find :

(i) H_Q at P = 0.5 mm

(ii) B_Q at P = 0.8 mm

(iii) Total magnetic flux inside the conductor

(iv) The total magnetic flux outside the conductor.

5. (a) Write the comparison between electrostatic and magnetostatics.

(b) Derive the magnetostatic boundary conditions.

6. (a) Explain the properties of magnetic material in detail.

(b) Derive expression for the divergence and curl of 'H'.

7. (a) Derive expression for Maxwell's equations in point and integral form.

(b) Explain inductance, mutual inductance and energy in magnetic fields.

8. (a) Explain the concept of wave propagation in dielectric medium.

(b) Explain Poynting vector and power consideration.