
B.E. (Full-Time)DEGREE END SEMESTER EXAMINATIONS, Nov./Dec. 2011

ELECTRICAL AND ELECTRONICS ENGINEERING

THIRD SEMESTER

EE9202 ELECTROMAGNETIC THEORY

(REGULATION 2008)

Time : 3 hr Max. Marks : 100

Answer ALL Questions

PART-A (10x2=20 marks)

1. What are the characterizing parameters of electromagnetic fields?
2. Plot **A** and gradient of **A**, where $\mathbf{A} = x^2+y^2$.
3. Explain uniform and non-uniform electric fields with suitable examples.
4. Explain how zero electric field can be achieved by using large uniformly charged sheets.
5. What is the line integral of magnetic field around the following closed paths.

6. Derive the self inductance of a long solenoid.
7. Calculate the average power dissipated per unit volume in a lossy dielectric medium with ε_r = 4.4, tanδ=0.001 if E =10kV/cm at f=5MHz.
8. A metal ring is placed on a solenoid. What will happen to the ring when the solenoid is energized? Why ?
9. Calculate the skin depth and wave velocity at 2MHz in Aluminium with conductivity 40MS/m and μ_r =1.
10. With a suitable figure , show the direction of propagation of electromagnetic for given E_z and H_y .

PART –B (5x16=80 marks)

11 (i) Derive the Electromagnetic wave equation in frequency domain.(8)

(ii) Derive the characterizing parameters for free space ,lossless and lossy dielectric.(8)

12.a (i) Derive **E** due to a long transmission line using Gauss's law .(8)

(ii) Two long parallel conductors of a DC transmission line separated by 2 meter have charges of ρ_l = 5μc /m of opposite signs. Both the lines are 8 meter above the ground. What is |**E**| at 4 meter directly below one of the lines. (8)

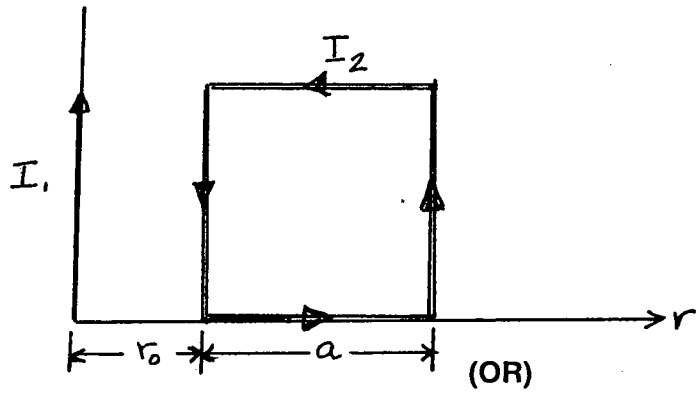
(OR)

12.b (i) Given that $\mathbf{E}_1 = 2\,a_x - 3\,a_y + 5\,a_z$ V/m at the charge free dielectric interface (plane of interface is XY plane). Calculate D_1, D_2 and the angles θ_1 and θ_2. (8)

(ii) Derive the formulae used.(8)

13.a (i) Derive the force between the current carrying conductors.(4)

(ii) Calculate the force experienced by a rectangular current loop carrying current I_2, in the presence of a long filamentary current I_1 as shown.(12)



(OR)

13.b (i) Derive for mmf in a series magnetic circuit .(8)

(ii) An airgap of 0.2 cm is cut across a steel ring of square cross section of area 25cm^2 . The average length of the flux path around the ring is 5m. What is the mmf required to establish a flux of 2.5mWb in the air gap. Assume $\mu_r = 1100$.(8)

14.a Consider a parallel plate capacitor having a plate area of 1cm^2 each, where the plates are separated by a distance of 0.1mm by a dielectric having the following properties at 1MHz $\varepsilon_r = 2, \sigma = 10^{-7}$ S/m. Calculate C, R, Id, Ic and tanδ. Derive the formulae used.(8+8)

(OR)

14.b (i) What is the need for Maxwell's contribution in electromagnetic fields and derive the same. (10)

(ii) Explain the working principle of Faraday's Disc generator, derive the output equation.(6)

15.a (i) Explain in detail the skin effect. (8)

(ii) Calculate the suitable frequency for communication by wireless with undersea craft at a depth of x =11m from the sea level for **E** at sea surface =1V/m and $\mathbf{E}_x = 1\mu$V/m

(OR)

15.b (i) Draw the electromagnetic frequency spectrum. (4)

(ii) Explain the positive and negative effects of EMF.(4)

(iii) Explain how a material changes its behavior with frequency and mention the criteria (8)