Hall Ticket No | | | | | | | | | | | Question Paper Code: AEC007

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Regular / Supplementary) - May, 2019

Regulation: IARE – R16

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

Time: 3 Hours **(ECE)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) State Gauss's law. Using divergence theorem and Gauss's law, relate the displacement density D to the volume charge density ρ_υ . **[7M]**

   (b) An infinite line of charge, with density ρ_LC/m is placed along the z-axis. Calculate the value of electric field intensity E, at the point $(\rho, \pi/2, 0)$. **[7M]**

2. (a) Define capacitance? Determine the expression for capacitance per unit length between two concentric conducting cylinders. **[7M]**

   (b) A uniform line of length 2m with total charge 3nC is situated coincident to z-axis with its center point 2m from the origin. Find the electric field intensity at a point on X-axis, 2m from origin. **[7M]**

UNIT – II

3. (a) State Biot-savart's law. Deduce the expression for magnetic field intensity 'H' using Biot-savart's law. **[7M]**

   (b) Plane y = 1 carries current K = 50 a_z mA/m. Find H at
   i. (0,0,0)
   ii. (1,5,-3). **[7M]**

4. (a) Write the word statements for Maxwell's two equations for magneto static fields and explain their significance. **[7M]**

   (b) A solenoid 3cm in length carries a current of 400 mA. If the solenoid is to produce a magnetic flux density of 5 mWb/m^2, how many turns of wire are needed? **[7M]**

UNIT – III

5. (a) Briefly explain linear and circular polarizations with necessary expressions. **[7M]**

   (b) A uniform plane wave is propagating in a medium as
   E = $2e^{-}z$ sin (108t - βz) ($\widehat{a_y}$) V/m. If the medium is characterized by
   ε_r=1, μ_r=20, and σ=3mhos/m, find β. **[7M]**

6. (a) Discuss about an electromagnetic wave that is incident normally on a perfect conductor for E and H fields. **[7M]**

   (b) Find the skin depth and surface resistance of an aluminum at 100 MHz having conductivity σ= 5.8x10^7/m, μ_r= 100. **[7M]**

UNIT – IV

7. (a) Discuss different types of distortions in transmission lines. Derive the condition for distortion less transmission line **[7M]**

   (b) At 8 MHz the characteristic impedance of transmission line is (40- j2) Ω and the propagation constant is (0.01+j0.18) per meter. Find the primary constants. **[7M]**

8. (a) Explain about loading of transmission lines and its types. **[7M]**

   (b) For a typical open wire telephone cable the primary constants are R=10Ω/km, L = 0.0037 H/Km, C = 0.0083 μF/Km, G = 0.4 × 10^{-6} mho/Km. Determine Z_o and the propagation constant at a frequency of 1 KHz. **[7M]**

UNIT – V

9. (a) Illustrate the expressions for the maximum and minimum values of voltage on a dissipation less line and hence deduce the expression for the standing wave ratio S in terms of voltage reflection coefficient. **[7M]**

   (b) The value of standing wave ratio on a lossless 75Ω line is 4.0. Calculate the maximum and minimum values of the voltage and current on the line when the incident voltage is 30V. **[7M]**

10. (a) Explain the significance and design of single stub impedance matching. Discuss the factors on which length depends? **[7M]**

    (b) A transmission line with a characteristic impedance of 300Ω is terminated in a purely resistive load. It is found by measurement that the minimum line voltage is 5mV and a maximum of 7.5mV. What is the value of load impedance. **[7M]**

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