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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Supplementary) - July, 2018

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 and explain Gauss's law and Write corresponding maxwell's equation. **[7M]**

   (b) Define Electric field intensity? Two point charges 1 mC and -2 mC are located at (3, 2, -1), and (-1,-1, 4), respectively. Calculate the electric force on a 10nC charge located at (0, 3, 1) and the electric field intensity at that point? **[7M]**

2. (a) Derive Poisson's and Laplace's equations. **[7M]**

   (b) A wire of diameter 1 mm and conductivity 5×10^7S/m has 10^{29} free electrons per cubic meter. When an electric field of 10mV/m is applied. Determine **[7M]**

   (i) The charge density of free electrons

   (ii) The current density

   (iii) The current in the wire

   (iv) The drift velocity of the electron

UNIT – II

3. (a) State and explain Biot-Savart's law to determine line current, surface current and volume current. **[7M]**

   (b) An infinitely long wire of radius 'r' is placed along the z-axis and carries current 'I' along 'z'. By applying ampere's circuit law, Find H at (r,φ,z). Sketch 'H' as function of 'p' . **[7M]**

4. (a) Determine the capacitance of a coaxial cable of inner radius 'a' and outer radius 'b'. **[7M]**

   (b) State and explain Faraday's laws of electromagnetic induction in both integral and differential forms. **[7M]**

UNIT – III

5. (a) Derive the expression for attenuation constant and phase constant in a lossy dielectric medium. **[7M]**

   (b) In a lossless dielectric for which $\eta = 60\pi, \mu_r = 1$ and $H = -0.1cos\,(\omega t - z)\,a_x + 0.5sin\,(\omega t - z)\,a_y A/m$, Calculate ε_r, ω, and E? **[7M]**

6. (a) Discuss about reflection and refraction of plane waves for normal incidence at the interface between two dielectrics. **[7M]**

   (b) State and prove Poynting theorem. Explain its significance. **[7M]**

UNIT – IV

7. (a) Prove that the velocity of propagation is same in distortion less line and loss less transmission line? **[7M]**

   (b) An air-line has a characteristic impedance of 70 Ω and a phase constant of 3 rad/m at 100 MHz. Calculate the inductance per meter and the capacitance per meter of the line. **[7M]**

8. (a) List out different types of transmission lines and write their applications. **[7M]**

   (b) Find the characteristic impedance, propagation constant and velocity of propagation for a transmission line having the following parameters: R=84 Ω/km, G=$10^{-6}\upsilon$/km, H=0.01H/km, C=0.061 μF/km frequency = 1000 Hz. **[7M]**

UNIT – V

9. (a) By using smith chart, Find the input impedance of 75 Ohms losses transmission line of length 0.1 λ, When the load is short. **[7M]**

   (b) Derive the relation between VSWR and reflection coefficient and write the formulae for reflection coefficient in terms of input impedance. **[7M]**

10. (a) Define input impedance of a transmission line and derive the expression for it. **[7M]**

    (b) Discuss about single and double stub matching with the help of neat sketches. **[7M]**

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