R16

Code No: 135AP

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, December - 2019
ELECTROMAGNETIC THEORY AND TRANSMISSION LINES
(Common to ECE, ETM)

Time: 3 Hours   Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B
consists of 5 Units. Answer any one full question from each unit. Each question carries
10 marks and may have a, b as sub questions.

PART - A
(25 Marks)

1.a) State Coloumb's Law. [2]
  b) What is Electric Potential? Give relation between E and V. [3]
  c) State Faraday's Law of electromagnetic induction. [2]
  d) What is a dielectric material? What are its applications? [3]
  e) Define Uniform Plane waves. [2]
  f) State Poynting Theorem. [3]
  g) Define Characteristic Impedance. [2]
  h) What are the different types of Transmission lines? [3]
  i) What are primary and secondary constants of Transmission line? [2]
  j) Explain about reflection coefficient. [3]

PART - B
(50 Marks)

2.a) Explain in detail about Electric Potential.
  b) Two point charges -4 µC and 5 µC are located at (2,-1, 3) and (0, 4, -2) respectively.
     Determine the potential at (1, 0, 1) assuming zero potential at infinity. [5+5]

OR

3.a) Prove that Electric field intensity E is the negative gradient of V.
  b) Formulate the Continuity of Current equation. [5+5]

4. In a certain conducting region $H=yz(x^2 + y^2) a_x - y^2xza_y + 4x^2y^2 a_z$ A/m

   a) Determine J at (5, 2, -3)
   b) Determine current passing through x=-1, 0<y, z<2
   c) Prove that ∇.B=0. [4+3+3]

OR

5. Explain the following boundary conditions with necessary equations:
   a) Dielectric-dielectric Interface
   b) Dielectric-conductor Interface. [5+5]

6. Explain the Reflection of plane waves at oblique incidences for
   a) Perfect Conductor
   b) Perfect Dielectric. [5+5]

OR

7. Describe the following in detail
   a) Brewster Angle
   b) Critical angle and Total Internal Reflection
   c) Surface Impedance. [3+4+3]

8.a) A transmission line operating at 500MHz has Z_o=80 Ω, α=0.04Np/m, β=1.5 rad/m. Determine the line parameters R, L, G and C.
   b) Formulate the condition for Distortionless and minimum attenuation transmission. [5+5]

OR

9.a) Explain the different types of loading in transmission lines.
   b) A distortionless line has Z_o=60 Ω, α=20mNp/m, u=0.6c, where c=3×10⁸m/sec. Determine R, L, G, C and λ at f=100MHz. [5+5]

10. Formulate expressions for input impedance of:
    a) Lossy Transmission line
    b) Lossless Transmission line. [5+5]

OR

11.a) A 30m long lossless Transmission line with Z_o=50 Ω operating at 2 MHz is terminated by a load of Z_L=60 +j40 Ω. If u=0.6c on the line, Determine
     i) Reflection coefficient
     ii) Standing Wave Ratio
     iii) Input Impedance [6+4]
    b) Explain in detail the applications of Smith Chart.

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