

**R13**

Code No: 114CU

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.Tech II Year II Semester Examinations, May-2015****ELECTROMAGNETIC THEORY AND TRANSMISSION LINES****(Electronics and Communication Engineering)****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, c as sub questions.

**Part- A****(25 Marks)**

- 1.a) State Coulomb's Law [2M]
- b) Write expression for E at point P for different types of charge distributions. [3M]
- c) Write applications of Ampere's circuital Law. [2M]
- d) Write Maxwell's equations in integral form. [3M]
- e) Write the wave equation for free space and conducting medium. [2M]
- f) Write the expressions for Brewster angle, critical angle and total internal reflection. [3M]
- g) Draw the equivalent circuit of a two wire transmission line. [2M]
- h) What are the losses in transmission lines? [3M]
- i) Write the applications of smith chart. [2M]
- j) What are the advantages of stub matching? [3M]

**Part-B****(50 Marks)**

- 2.a) State Gauss's law. Deduce Coulomb's law from Gauss's law.
  - b) Given  $V = 5x^3y^2z$  and  $\epsilon = 2.25\epsilon_0$ , find i) E at point P (-3, 1, 2) ii)  $\rho_v$  at P. [5+5]
- OR**
- 3.a) Derive continuity equation.
  - b) Define and explain the following:  
i) Electric flux density D ii) Electric field intensity E. [6+4]
4. State Ampere's circuit law. A hollow conducting cylinder has inner radius  $a$  and outer radius  $b$  and carries current  $I$  along the positive  $z$ -direction. Find  $\mathbf{H}$  everywhere. [10]
- OR**
- 5.a) Using Ampere's circuital law, find  $\mathbf{H}$  due to any an infinite sheet of current.
  - b) Write the differences between displacement current density and conduction current density. [5+5]
- 6.a) Explain the concepts of conduction, convection and displacement current in materials.
  - b) What are "isotropic" and "homogeneous" dielectric materials? [5+5]
- OR**
- 7.a) State and prove Poynting theorem.
  - b) Define Brewster angle and discuss the Brewster and degree of polarization. [5+5]

- 8.a) Derive an expression for reflection when a wave is incident on a dielectric obliquely with parallel and perpendicular polarization.
- b) A medium is characterized by  $\sigma = 0$ ; and  $\mu = 2\mu_0$  and  $\epsilon = 5\epsilon_0$ . If  $H = 2 \cos(\omega t - 3y) \hat{a}_z$  A/m, calculate  $W$  and  $E$ . [5+5]

**OR**

- 9.a) Derive the relationship between secondary constants and primary constants of a transmission line.
- b) What is meant by distortion? Derive the conditions for a distortionless transmission line. [5+5]
- 10.a) Explain the reflection coefficient and voltage standing wave ratio of a transmission line.
- b) Describe the applications and characteristics of  $\lambda/2$  and  $\lambda/4$  lossless transmission line elements. [5+5]

**OR**

- 11.a) Explain VSWR and Reflection Coefficient. Derive Expression for the same.
- b) A 30m long lossless transmission line with  $Z_0 = 50\Omega$  operating at 2 MHz is terminated by a load  $Z_L = 120 + j40$  on the line. Find:  
i) the reflection coefficient ii) the VSWR and the input impedance.  
Velocity of signal on the line is  $v = 0.6C$  ( $C$  = velocity in free space) (Use smith's chart). [4+6]

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