Code No: 114CU **R13**

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 $\varepsilon=2.25\varepsilon_0$, find i) E at point P (-3, 1, 2) ii) ρ_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 **H** everywhere. [10]

OR

5.a) Using Ampere's circuital law, find 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 $\varepsilon = 5\varepsilon_0$. If $H = 2\cos(\omega t - 3y)\, a_z$ 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 distrortionless 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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