

**R09**

Code No: 09A40404

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD**  
**B.Tech II Year II Semester Examinations, November / December-2013**  
**ELECTROMAGNETIC THEORY AND TRANSMISSION LINES**  
(Common to ECE, ETM)

Time: 3 hours

Max. Marks: 75

**Answer any five questions**  
**All questions carry equal marks**

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- 1.a) State and explain Coulomb's law using vector form of Coulomb's force expression.
  - b) Using Gauss' law derive expressions for electric field intensity and electric flux density due to an infinite sheet of conductor of charge density  $\rho C/m$ . [15]
  - 2.a) Derive Poisson's and Laplace equations starting from Gauss' law.
  - b) A parallel plate capacitance has 500 mm side plates of square shape separated by 10 mm distance. A sulphur slab of 6mm thickness with  $\epsilon_r = 4$  is kept on the lower plate. Find the capacitance of the set up. If a voltage of 100 volts is applied across the capacitor, calculate the voltage at both the regions of the capacitor between the plates. [15]
  - 3.a) Derive an expression for force between two straight long parallel current carrying conductors. What will be the nature of force if the currents are in the same and opposite directions?
  - b) Derive the expressions for magnetic field intensity due to finite and infinite line. [15]
  - 4.a) Write Maxwell's equation in point and integral form for good conductors.
  - b) A potential field is given as  $V = 100e^{-5x} \sin 3y \cos 4z$  V. Let the point P (0.1,  $\pi/12, \pi/24$ ) be located at a conductor free space boundary. At point P, find the magnitudes of, i)  $V$  ii)  $\vec{E}$  iii)  $E_t$  iv)  $E_N$  v)  $\vec{D}$  vi)  $D_N$  vii)  $\rho_s$ . [15]
  - 5.a) Find all the relations between E and H in a uniform plane wave. Find the value of intrinsic impedance of free space.
  - b) Derive the expression for attenuation and phase constants of uniform plane wave. [15]
  - 6.a) Derive the expressions for reflection and transmission coefficients, when a Uniform plane wave incidents normally on surface of a perfect dielectric.
  - b) A uniform plane wave is incident normally on an infinitely thick slab of a material with 25 V/m electric field. The material has a dielectric constant 4. How much power penetrates the material slab? [15]
  - 7.a) Describe the losses in transmission lines.
  - b) Derive the characteristic impedance of a transmission line in terms of its line constants. [15]
  - 8.a) Derive the expression for the input impedance of a loss-less line. Hence evaluate  $Z_{sc}$  and  $Z_{oc}$ .
  - b) Write about impedance matching and discuss about various matching techniques. [15]

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