

Code No: 09A40404

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B.Tech II Year II Semester Examinations, June-2014

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 Coulombs law.
- b) Three point charges Q1: 0.5nC, Q2: 0.4nC, Q3: -0.6nC are located in free space at (0, 0), (3, 0) and (0, 4) respectively. Determine the potential, electric field intensity and flux density at (3, 4).
- 2.a) Determine the amount of work necessary to assemble three point charges Q1, Q2 and Q3 in an empty space. Extend your result to n-point charges.
- b) The electric field intensity in the atmosphere at the earth surface is 200V/m and 20V/m at 1400m above the earth surface directed downwards. What is the average charge density in the atmosphere below 1400 m?
- 3.a) Determine the value of Magnetic flux density at the center of a square filament of side 'a' carrying current I.
- b) A toroidal ring has 200 turns. The outer diameter of the ring is 15cm with the inner diameter of 12cm. Find the flux density if the current is 8A.
- 4.a) Two loss less mediums 1( $\mu_1, \epsilon_1$ ) and 2 ( $\mu_2, \epsilon_2$ ) are separated by a plane. A wave is normally incident from plane1. Use Maxwell's equations to find the boundary conditions.
- b) Let  $\mu = 3 \times 10^{-5}$  h/m,  $\epsilon = 1.2 \times 10^{-10}$  F/m and  $\sigma = 0$  everywhere, If  $H = 2 \cos(10^{10}t - \beta x) a_z$  A/m. Use Maxwell's Equation to find  $\beta$ .
- 5.a) Derive the equation for uniform plane wave in free space condition.
- b) The electric field in free space is given by  $E = 50 \cos(10^8 t + \beta x) a_y$  V/m. Find the direction of wave propagation. Calculate  $\beta$  and the time it takes to travel a distance of  $\lambda/2$ .
- 6.a) Discuss the significance of pointing theorem and derive the equation for pointing vector.
- b) A vertically polarized uniform plane wave is incident at an angle of  $45^\circ$  from air on a dielectric slab of  $\epsilon_r = 4$ ,  $\mu_r = 1$  and  $\sigma = 0$ . The incident field strength is 100mV/m at 10MHz. Calculate the power transmitted to the dielectric slab; Find the angle of incidence for which angle of reflection is zero.
- 7.a) Obtain the expression for input impedance of transmission line.
- b) A  $\lambda/2$  section of a 600  $\Omega$  transmission line short circuited at one end and open circuited at other end. A 100V/75  $\Omega$  generator is connected at the midpoint of the section. Find the voltage at the open circuit end of the line.
- 8.a) Briefly explain about stubs and impedance matching by use of stubs.
- b) A Load of 100+j180  $\Omega$  is connected to a 75  $\Omega$  lossless line. Find  $\gamma$ , S and  $Z_{in}$  at the generator using smith chart.