B.Tech II Year II Semester (R15) Regular Examinations May/June 2017

ELECTROMAGNETIC THEORY & TRANSMISSION LINES

(Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Define electric field and electric flux density.

(b) Define electric dipole. Differentiate between polar and nonpolar dielectrics.

(c) State and express the Stokes theorem.

(d) Write down the Maxwell's equations in free space condition.

(e) Define skin depth or depth of penetration.

(f) State and express the Poynting theorem.

(g) Write down the distortion less line.

(h) Define transmission line. Explain different types of transmission lines.

(i) Define the voltage standing wave ratio.

(j) Difference between the single stub matching and double stub matching.

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 Uniform line charge of 0.4 μC and -0.4 μC are located in the $x = 0$ plane at $y = -0.6$ and 0.6 m respectively. Let $\varepsilon = \varepsilon_0$. Find E at:

(a) $P(x, 0, z)$

(b) $Q(2, 3, 4)$

OR

3 Given $D = 8\rho \sin\phi \hat{a}_\rho + 4\rho \cos\phi \hat{a}_\phi \; C/m^2$.

Find the volume charge density at $P(2.6, 38°, -6.1)$.

How much charge is located inside the region defined by $0 < \rho < 1.8, 0° < \phi < 70°, 2.4 < z < 3.1$.

UNIT - II

4 A unit vector directed from region 1 to region 2 at the planar boundary between two perfect dielectrics is given as $\hat{a}_{N12} = (-2/7)\hat{a}_x + (3/7)\hat{a}_y + (6/7)\hat{a}_z$. Assume $\varepsilon_{r1} = 3$, $\varepsilon_{r2} = 2$ and electric field in region 1 is $\vec{E}_1 = 100\hat{a}_x + 80\hat{a}_y + 60\hat{a}_z \; V/m$. Find the electric field $\vec{E}_2$, polarization vector $\vec{P}_2$ in region 2 and the angles made by the vectors $\vec{E}_1$ and $\vec{E}_2$ with the normal to the interface.

OR

5 Derive an equation for magnetic field intensity due to:

(a) Infinite line placed along z-axis at an observation point P on y axis.

(b) Infinite sheet with uniform current density placed in z = 0 plane.

Contd. in page 2

Code: 15A04403 **R15**

UNIT - III

6 In a lossless medium $\eta = 40\pi$, $\mu_r = 1$ and $H = 2\cos(\omega t - z)\hat{a}_x + 5\sin(\omega t - z)\hat{a}_y A/m$. Find ε_r, ω and E for the medium.

OR

7 In a medium $\vec{E} = 16e^{-0.05x}\ \sin(2 \times 10^8 t - 2x)a_z\ V/m$ find:

(a) Propagation constant.

(b) Wavelength.

(c) Speed of the wave.

UNIT - IV

8 In a nonmagnetic material $H = 30\cos(2\pi \times 10^8 t - 6x)\hat{a}_y\ mA/m$. Calculate:

(a) The intrinsic impedance.

(b) The Poynting vector.

(c) The time average power crossing the surface.

$x = 1,\ 0 < y < 2,\ 0 < z < 3\ m.$

OR

9 Explain reflection of uniform plane wave by a perfect conductor in the case of oblique incidence for parallel polarization.

UNIT - V

10 A transmission line 100 km long has the following impedance measurements at 1796 Hz, $Z_{oc} = 328\angle -29.2°$, $Z_{sc} = 1548\angle 6.8°$. Determine the primary line constants.

OR

11 Using Smith chart, determine VSWR, the input impedance and reflection coefficient at the input end of a transmission line of 50 Ω, terminated by a load impedance of $Z_L = 25 + j50\ \Omega$. The length of the line is 60 cm and the wavelength on the line $\lambda = 2\ cm$.

*****