(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETEE-210 **Subject: Electromagnetic Field Theory (Batch 2013 Onwards)**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt all questions as directed. Internal choice is indicated.

Q1 (a) What is meant by surface charge density. Determine the field inside a uniformly charged sphere. **(3)**

(b) Calculate the capacitance of a coaxial capacitor of length l where the inner and outer conductor have diameter d and D respectively. **(3)**

(c) Derive Ampere's circular law in differential form. **(3)**

(d) Find out the field strength at 30 km away from a transmitting station of 25 kW power. **(3)**

(e) What is meant by stub matching? What are the advantages associated with it? **(3)**

(f) Define the term displacement current and give its physical significance. **(3)**

(g) What is meant by circular polarization? **(3)**

(h) A plane wave traveling in air is normally incident on a block of paraffin with $\varepsilon_r = 2.2$. Find the reflection coefficient. **(4)**

Q2 A large parallel plate capacitor has its plate normal to x-axis. Plate 1 with potential $v = 0$ is at $x = 0$ and Plate 2 with potential $v = v_1$ is at $x = x_1$. Use Laplace's equation for the capacitor to show that the potential distributed is given by **(12.5)**

$$V = (v_1/x_1)\,x$$

OR

Explain the principle of method of images to solve electrostatic problems. State the conditions in which the method is applicable.

Q3 A square current loop, which each side is 2.5 meters long, is carrying 5 Amps current. Calculate (i) Magnetic flux density (ii) Field intensity at the center of the square. **(12.5)**

OR

Derive an expression for vector potential A_V due to a long wire of circular cross sectional area carrying a current of I Amps. Hence deduce expression for magnetic flux density B.

Q4 Assuming zero charge density, write the corresponding four Maxwell's equation for medium assumed to be both electrically and magnetically homogeneous and isotropic. Hence obtain the wave equation for an absorbing medium. **(12.5)**

OR

The electric field intensity of a uniform plane wave propagating in a perfect dielectric having unity relative permeability is

$$\vec{E} = 10\cos(6\pi \times 10^7 t - 0.4\pi z)\,\vec{a}_x\,V/m$$

Find (i) frequency (ii) wavelength (iii) phase velocity (iv) permittivity (v) magnetic field intensity $\vec{B}$.

Q5 For a lossless transmission line prove that **(12.5)**

(a) Open Circuit impedance $Z_{oc} = -j\cot\beta l$

(b) Short circuit impedance $Z_{sc} = jZ_0\tan\beta l$

When does short circuit line behave like resonant circuit?

OR

Define reflection coefficient and prove that reflection coefficient is.

$$K = \frac{Z_R - Z_0}{Z_R + Z_0}$$

****

P