Printed Pages: 02 Sub Code: REC402

Paper Id: 131412 Roll No.

B. TECH
(SEM-IV) THEORY EXAMINATION 2017-18
ELECTROMAGNETIC FIELD THEORY

Time: 3 Hours *Max. Marks: 70*

Note: *Be precise in your answer. In case of numerical problem assume data wherever not provided*

SECTION – A

1. Attempt all parts of the following questions: 2×7=14

(a) Write the Poisson's and Laplace equation.

(b) State point form of ohms law & Gauss's law.

(c) Explain Biot-Savart's Law.

(d) Give Maxwell's equations in differential and integral form.

(e) Give applications of Smith chart.

(f) Transform the point P(5,3,6) in cylindrical coordinate system.

(g) Explain Faraday's law.

SECTION B

2. Attempt any three parts of the following questions: 3×7=21

(a) Calculate the capacitance formed by two back to back cones separated by infinitely small distance.

(b) State and derive ampere circuital law. A single turn circle coil of 50 meters in diameter carries current 28×10^4 Amp. Determine the magnetic field intensity H at a point on the axis of coil and 100 meters from the coil. The relative permeability of free space surrounding the coil is unity.

(c) Prove that magneto static energy is given by

$$W_m = \frac{1}{2}\int_V \varepsilon H^2 dv.$$

(d) Determine the magnetic flux density B at a distance d meter from an infinite straight wire carrying current I. Also find out when the length of the wire is semi-infinite.

(e) A uniform plane wave propagating in good conductor. If the magnetic field intensity is given by $H = 0.1e^{-15}\cos(2\pi \times 10^8 l - 15z)\, i$ A/m, determine the conductivity and corresponding component of E field. Also calculate the average power loss in a block of unit area and thickness t.

SECTION C

3. Attempt any One part of the following questions: 7×1=7

(a) State and explain Maxwell's equations for time varying fields in differential and integral forms and their significance.

(b) (i) Find the divergence of a vector $A = 8x^2 i_x + 5x^2y^2 i_y + xyz^3 i_z$ and del ∇ of a scalar function x^2yz.

(ii) Describe the gradient of a scalar field.

4. Attempt any One part of the following questions: 7×1=7

(a) Point charges $Q_1 = 1nC, Q_2 = -2nC, Q_3 = 3nC \; and \; Q_4 = -4nC$ are positioned one at a time in that order at (0,0,0), (1,0,0), (0,0,-1) and (0,0,1) respectively. Calculate the energy in the system after each charge is positioned.

(b) Explain Skin effect. Derive the expression for α and β in a conducting medium.

5. Attempt any One part of the following questions: 7×1=7

(a) Define propagation constant and characteristic impedance. Derive the boundary conditions for electric field between two dielectrics having different permittivity interfaces.

(b) State Poynting theorem. Derive the mathematical expression for Poynting theorem.

6. Attempt any One part of the following questions: 7×1=7

(a) A transmission line operating at 500 MHz has $z_0 = 80\ \Omega$, $\alpha = 0.04$ NP/m, β= 1.5 rad/m. Find the line parameters R, L, G, C.

(b) Explain the phenomena of polarization and its types.

7. Attempt any One part of the following questions: 7×1=7

(a) Find the potential function and electric field intensity for the region between two concentric right circular cylinders where V=V_0 at r=a and V=0 at r=b (b>a)?

(b) Explain the reflection of plane wave for normal indices. Discuss about Reflection and transmission coefficient for **F** and **H**.