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EC-402

Printed Pages : 1

(Following Paper ID and Roll No. to be filled in your Answer Books)											
PAPER ID :	Roll No.										

B.TECH. Theory Examination (Semester-IV) 2015-16 **ELECTROMAGNETIC FIELD THEORY (EMFT)**

Time : 3 Hours

SECTION -A

Max. Marks : 100

1. Attempt all the parts.

- a) What is the divergence of curl of a vector?
- b) Write the Poisson's and Laplace equation.
- c) State Gauss's Law for magnetic field.
- d) Write the wave equation in a conducting medium.
- e) Write the condition for distortion less transmission line.
- f) Verify that the vectors A = 4ax 2ay + 2az and B = -6ax + 3ay 3az are parallel to each other.
- g) Give the relationship between potential gradient and electric field.
- h) Write the Maxwell's equations in integral & differential form.
- i) Write the various parameters of a transmission line.
- i) What is complex pointing vector?

SECTION-B

2. Attempt any 5 questions from this section.

- a) i) Find the divergence of a vector $A = 8x^2i_x + 5x^2y^2i_y + xyz^3i_z$ and del ∇ of a scalar function x^2yz . ii) Described the gradient of a scalar field.
- b) Given point P (-2, 6, 3) and vector A = yax + (x+z)ay. Evaluate A and at P in the Cartesian, cylindrical and spherical systems
- c) Determine the self –inductance of coaxial cable of inner radius **a** and outer radius **b**.
- d) Point charges $+3\mu$ C and -3μ C are located at (0, 0, 1 mm) and (0, 0, -1 mm) respectively in free space. i) Find the dipole moment \overline{P} .

ii) Find the electric field intensity vector \overline{E} in spherical components at point P(r = 2, $\theta = 40^{\circ}, \phi = 50^{\circ}$)

- State and derive ampere circuital law. A single turns circle coil of 50 meters in diameter carries current e) 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.
- f) Derive transmission line differential equation. Derive the condition of loss-less transmission from it.
- g) Using the concept of Maxwell's equation explain how waves propagates in guided waves.
- h) 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.

SECTION-C

Attempt any 2 questions from this section.

- 3. (a) Discuss and proof the Poynting's theorem and also mention its application.
 - (b) Establish the following vector identity: (i) $A \times (B + C) = (A, C)B - (A, B)C$

(i)
$$\nabla (\nabla \times A) = 0$$

- 4. (a) Derive the electric field for each possible case due to an uniformly charged sphere of radius R and volume charge density ρ .
 - (b) Define dielectric dielectric boundary conditions.
- 5. (a) What is meant by distortionless line? Compare the advantage and disadvantage of coaxial cables and two wire transmission line.
 - (b) Discuss the following terms as applied to vector field:
 - (i) Gradient
 - (ii) Curl and its physical interpretation

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 $(2 \times 10 = 20)$

(5 x 10=50)

 $(2 \times 15=30)$