



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

PAPER ID :

Roll No.

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B.TECH.

Theory Examination (Semester-IV) 2015-16 ELECTROMAGNETIC FIELD THEORY (EMFT)

Time : 3 Hours

Max. Marks : 100

SECTION -A

1. Attempt all the parts.

(2 × 10 = 20)

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

SECTION-B

2. Attempt any 5 questions from this section.

(5 × 10 = 50)

- Find the divergence of a vector $A = 8x^2i_x + 5x^2y^2i_y + xyz^3i_z$ and $\text{del } \nabla$ of a scalar function x^2yz .
 - Describe the gradient of a scalar field.
- 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
- Determine the self-inductance of coaxial cable of inner radius a and outer radius b .
- Point charges $+3\mu C$ and $-3\mu C$ are located at (0, 0, 1 mm) and (0, 0, -1 mm) respectively in free space.
 - Find the dipole moment \vec{P} .
 - Find the electric field intensity vector \vec{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 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.
- Derive transmission line differential equation. Derive the condition of loss-less transmission from it.
- Using the concept of Maxwell's equation explain how waves propagate in guided waves.
- 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.

(2 × 15 = 30)

- Discuss and prove the Poynting's theorem and also mention its application.
 - Establish the following vector identity:
 - $A \times (B + C) = (A \cdot C)B - (A \cdot B)C$
 - $\nabla \cdot (\nabla \times A) = 0$
- Derive the electric field for each possible case due to an uniformly charged sphere of radius R and volume charge density ρ .
 - Define dielectric – dielectric boundary conditions.
- What is meant by distortionless line? Compare the advantage and disadvantage of coaxial cables and two wire transmission line.
 - Discuss the following terms as applied to vector field:
 - Gradient
 - Curl and its physical interpretation

