*Total No. of Questions : 8]* *[Total No. of Printed Pages : 2*

**Roll No** .....

# EC-5001 (CBGS)

## B.E. V Semester

Examination, November 2018

## Choice Based Grading System (CBGS)

## Electromagnetic Field Theory

***Time : Three Hours***

***Maximum Marks : 70***

*Note:* i) Attempt any five questions.
ii) All questions carry equal marks.
iii) Assume any missing data.

1. a) Define gradient, divergence and curl of a vector field with the help of suitable examples. Write down their physical significance.
   b) Describe Coulomb's Law. Explain electric field intensity due to line charge.

2. a) Derive and explain Laplace's and Poisson's equation. Define dipole and dipole moment for electrostatic fields.
   b) A potential field is given as $V=100e^{-5x}\sin 3y\cos 4z$ Volts.

   Let point $P\left(0.1, \pi/12, \pi/24\right)$ be located at a conductor free space boundary. At point P, find the magnitude of
   i) V
   ii) $\bar{E}$
   iii) $E_N$
   iv) $E_t$
   v) $\rho_s$





3. a) State and explain Ampere's circuital law in integral and differential form. Discuss its applications.
   b) Obtain boundary conditions for magnetic field.

4. a) Determine the magnetic field intensity $\bar{H}$ at the centre of a square current element. The length of each side is 2m and the current I = 1.0Amp.
   b) Explain Faraday's law. Write the differential or point form of Faraday's law.

5. a) Explain Maxwell's equation in integral and differential forms.
   b) Derive and explain Helmholtz wave equation. Write down the properties of plane waves.

6. a) What is Polarization? Explain circular and elliptical polarization with the help of neat sketches.
   b) Explain:
      i) Good conducting and ionized media
      ii) Complex permittivity
      iii) Loss tangent
      iv) Skin depth

7. a) Define reflection coefficient and transmission coefficient. Derive relationship between them.
   b) Explain Brewster's angle, total internal reflection, phase velocity and group velocity.

8. Write short notes on (any three)
   a) Magnetic vector potential for sources in free space
   b) Transmission line analogy
   c) Uniqueness theorem
   d) Biot-Savart's Law
   e) Frequency dispersive propagation

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