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

Roll No .....

EC-402 (GS)

B.E. IV Semester

Examination, November 2019

Grading System (GS)

Electromagnetic Theory

Time : Three Hours

Maximum Marks : 70

Note : i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) Prove Laplace's and Poisson's equation.
   b) State and prove boundary conditions for electric field.

2. Find $\overline{E}$ at the origin due to a point charge of 64.4×10^{-9} coulombs, located at (–4, 3, 2)m in Cartesian co-ordinate.

3. A current element of length L carrying a current I is directed along the z direction. Find the magnetic vector potential and magnetic field intensity at a very distant point.

4. Give mathematical analysis of magnetic field boundary conditions.

5. An electric field in free space is described by

   $$\overline{E} = 10\cos(\omega t + ky)\overline{a_x}$$

   If the time period is 100 ns. Determine the constant k and the average power density.

6. Derive the Maxwell's equations in (a) Point form and (b) Integral form

   OR

   State and prove the Poynting theorem.

7. Derive the expressions for propagation constant, attenuation constant, phase constant and intrinsic impedance when the plane wave propagating in good conductor.

   OR

   Derive the expression for electric field and magnetic field when the plane wave oblique incidence at a plane conducting boundary and horizontally polarized.

8. Explain what is skin depth? Calculate α, β, γ, λ, γ_p and n for a damp soil at $f = 10^6$ Hz. It is given that for damp soil $\epsilon_r = 12$, $\sigma = 2\times10^{-2}$ mhos/m. $\mu_r = 1$. where η = intrinsic impedance, λ = wavelength.

   OR

   a) Derive wave equations for non-conducting medium?
   b) Calculate the phase velocity and the magnitude of the attenuation constant of plane wave at a frequency of 10 GHz in polyethene. It is given that $\mu = \mu_0$, $\epsilon_r = 2.3$ and $\sigma = 2.56\times10^{-4}$ mhos/m.

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