Ajay Kumar Garg Engineering College, Ghaziabad

Department of ECE

Sessional Test-2

Course:	B. Tech	Semester:	V
Session:	2017-18	Section:	EN-1, EN-2
Subject:	Fundamentals of E.M Theory	Sub. Code:	NEC-508
Max Marks:	50	Time:	2 hour

Note: Answer **all** the sections.

Section-A

A. Attempt **all** the parts. **(5x2 =10)**

1. Tabulate the analogy between Electric and Magnetic Fields.
2. For the current density $J = 10z\ sin^2 \emptyset\ \hat{a}_\rho\ {}^{A}/_{m^2}$, Find the current through the cylindrical surface $\rho = 2, 1 \leq z \geq 5\ m.$
3. Given the potential $V = \frac{10}{r^2}\ \sin\theta \cos\emptyset$, find the electric flux density **D** at$(2, \pi/2, 0)$.
4. State and explain Poison's and Laplace's equation.
5. Define continuity equation?

Section-B

B. Attempt **all** the parts. **(5x5 = 25)**

6. State the Coulombs law and derive the electric field intensity for the infinite line charge distribution.
7. Calculate the electric flux density everywhere for a Uniformly Charged Sphere (application of Gauss law) of radius 'a' with a uniform charge ρ_o.

   Given that $\boldsymbol{D} = z\rho\ cos^2 \emptyset\ \hat{a}_z\ {}^{C}/_{m^2}$, calculate the charge density at (1, π/4, 3) and the total charge enclosed by the cylinder of radius 1m with $-2 \leq z \geq 2\ m.$
8. Derive an expression for energy density in electrostatic fields.
9. A spherical capacitance with a = 1.5 cm, b = 4 cm has an inhomogeneous dielectric of $\epsilon = \frac{10\ \epsilon_0}{r}$ Calculate the capacitance of the capacitance.
10. State Biot Savart's law and derive an expression for magnetic field intensity due to infinite straight line current carrying conductor.

Section-C

C. Attempt **all** the parts. **(2x7.5 = 15)**

11. Derive all the Maxwell Equation with their physical significance for time invariant electric and magnetic field.

12. Discuss various boundary conditions as applied to electric field between dielectric – dielectric, conductor - dielectric and conductor- free space.