**Con. 6655-13.** **GS–7473**

(3 Hours) **[ Total Marks : 100**

**N.B. :** (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) Assume any **suitable** data if **required**.
(4) **Figures** to the **right** indicate **full** marks.

1. Solve any **four** :– **20**
   (a) Derive the equation of Electric potentail due to Electric dipoles.
   (b) A point charge of 100 μc is located at origin. Find electric potential at (1,2,3) m.
   (c) State and explain Gauss's law.
   (d) Find out the total charge present in the closed surface defined by $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$ if $\rho_v = \frac{10x^2}{4} C/m^3$.
   (e) State and explain Divergence theorem.

2. (a) Derive Poisson's and Laplace's equation. **10**
   (b) Derive the equation for Electric field intensity due to infinite surface charge or plane charge. **10**

3. (a) Show that – (i) $\nabla \cdot \overline{D} = 0$ for the field of point change **10**
   (ii) $\nabla \cdot \overline{E} = 0$ for the field of uniform line charge.
   (b) Evaluate both sides of divergence theorem for the field $\overline{D} = 2xyz\,\hat{a}_x + 3y^2z\,\hat{a}_y + x\,\hat{a}_z$ **10**
   for the region defined by $-1 \leq x \leq 1$, $-1 \leq y \leq 1$ and $-1 \leq z \leq 1$.

4. (a) State and explain continuity equation and displacement current. **10**
   (b) Derive the equation for Magnetic field intensity due to finite straight line current carrying conductor. **10**

5. (a) Explain stoke's theorem and Ampere circuital law. **10**
   (b) Find 'H' inside and outside of a solid cylindrical conductor of radius 'a' meter where I is uniformly distributed over the cross section. **10**

6. (a) State and derive the equations for Poynting theorem. **10**
   (b) Derive the Electromagnetic wave equation for good conductor. **10**

7. Write short notes on any **two** :– **20**
   (a) Boundary condition in Electrostatic and magnetostatic
   (b) Reflection of uniform plane wave
   (c) Wave impedance for free space.

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