Duration: 3 Hours Marks: 80

- 1] Question no. 1 is Compulsory
- 2] Attempt any three questions out of remaining questions
- 3] Assume suitable data if require
- Q1 Attempt any Four

(20 Marks)

- a) Calculate charge density due to electric flux density $\overline{D} = 4r \sin \phi \, \widehat{a_r} + 2r \cos \phi \, \widehat{a_\phi} + 2z^2 \widehat{a_z} \, C/m^2$
- **b)** Obtain point format of Continuity equation
- c) Express Biot Savart's law in vector format
- d) For parallel plates capacitor with plate area $10cm^2$ and plates saperation 3mm has voltage of $100 \sin 10^3 t$ V applied to its plates. Calculate displacement current density ($\varepsilon = 2\varepsilon_0$)
- e) Define following terms:
 - Uniform Plane waves
 - TEM wave
- f) Define the term Characteristic Impedance, Write expression for the same for Lossy and Lossless lines
- g) Show that $\bar{E} = -\nabla V$

Q. 2 (20 Marks)

- A sheet charge of $\rho_s = 2nC/m^2$ located at x = 2 in free space and line charge $\rho_l = 20nC/m$ is located at x = 1 & z = 4, find electric field at the origin and direction of electric field at (4,5,6)
- **b)** For infinite long conductor of radius 'a' carrying current I, determine Magnetic field everywhere.

Q. 3 (20 Marks)

- a) Explain in brief Maxwell's Equation for Time varying field in Integral and Point format, also give their significance
- Magnetic field component of an EM wave propagating through a non-magnetic medium $(\mu = \mu_0)$ is:

$$\overline{H} = 25\sin(2 \times 10^8 t + 6x)\overline{a_y} \ mA/m$$

Determine:

- The direction of wave propagation
- The permittivity
- Electric Field

 $\mathbf{Q.4}$ (20 Marks)

a) List boundary conditions for time varying field if given that:

$$\overline{D} = 50\overline{a_x} + 80\overline{a_y} - 30\overline{a_z} \, nC/m^2$$

In region $x \ge 0$ where $\varepsilon = 2.1\varepsilon_0$. Find Electric charge density for region $x \le 0$ where $\varepsilon = 7.6\varepsilon_0$.

- b) Obtain Poission's and Laplacian's Equation used to solve boundary problems for conducting plates described as V(z=0) = 0V and V(z=2mm) = 50V. Determine:
 - 6 A
 - ullet
 - lacksquare

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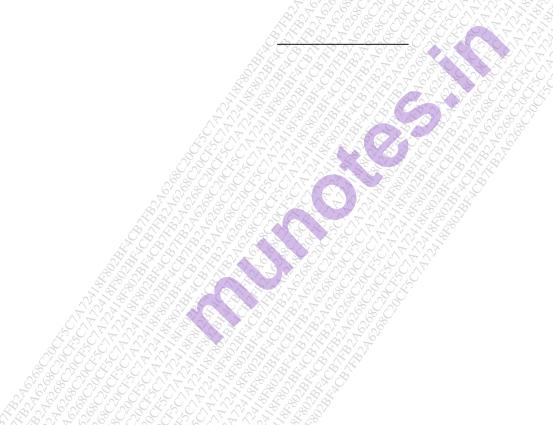
Q. 5 (20 Marks)

- a) Lossless 50Ω transmission line terminated by a load impedance $Z_L = 75 + 60j \Omega$, using Smith chart determine:
 - Reflection Coefficient
 - SWR
 - Input Impedance at 0.2λ from load verifying the same using analytical solution
- b) Obtain Integral form of Poynting Theorem and Explain significance of each term

Q. 6 Write short note on

(20 Marks)

- a) Electric Dipole
- **b**) Electrostatic discharge
- c) Magnetic Levitation
- **d**) Wave propagation through lossy dielectrics



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