

Roll No.:

National Institute of Technology, Delhi

Name of the Examination: Re-Mid Sem Exam (Oct 2023)

Branch	: ECE (B.Tech)	Semester	: III
Title of Course	Electromagnetic Theory	Course Code	ECL-203

Time: 1 Hour 30 Minutes

Maximum Marks: 25

Note : All questions are compulsory. Figure in right hand margin indicates full marks for the question.

1. Given a vector $\mathbf{V} = (3x + Az) \hat{\mathbf{a}}_x + (Bx - 5z) \hat{\mathbf{a}}_y + (4x - Cy + Dz) \hat{\mathbf{a}}_z$ [2]
What will be the values of A , B , C , and D if the vector \mathbf{V} is irrotational and solenoidal?
2. A volume charge density is expressed as $\rho_v = 10z^2 \sin(\pi y)$. Find the total charge inside the volume $(-1 \leq x \leq 2)$, $(0 \leq y \leq 1)$, $(3 \leq z \leq 3.6)$. [3]
3. Find \mathbf{E} at $P(1, 5, 2)$ m in free space if a point charge of $6\mu\text{C}$ is located at $(1, 1, 1)$, the uniform line charge with density $\rho_L = 100 \text{ nC/m}$ along x axis.. [5]
4. $Q_1 = -20 \text{ uC}$ and $Q_2 = 50 \text{ uC}$ are the point charges located at $P(-6, 4, 6)$ and $R(5, 8, -2)$ in free space. Find the force exerted on Q_2 by Q_1 in vector form. [5]
5. The charge lies on the circular disc $r \leq 4\text{m}$, $z = 0$, with density $\rho_s = (10^{-4}/r) \text{ C/m}^2$. Determine \mathbf{E} at $r = 0$, $z = 3\text{m}$. [5]
6. Derive the expressions for electric field intensity and electric flux density at point P on the z axis at $z = h$ m due to infinite sheet of charge placed in xy plane with charge density ρ , C/m^2 . [5]