

TE sem IV 'C' scheme summer 2025

Time: 3 Hours

Max. Marks: 80

Note :

ELEC

11/6/25

- Question No.1 is compulsory.
- Solve ANY THREE questions from the remaining five questions.
- Figure to the right indicates full marks.
- Assume suitable data wherever required, but justify the same.

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| Q. 1 | Solve ANY FOUR questions from following. (Each question carries 5 marks) |
| a) | "The line integral of the magnetic field around some closed loop is equal to the sum of the currents which pass through the loop". Justify the statement. (05) |
| b) | Explain Lorentz's force equation for moving charge. Enlist it's application (05) |
| c) | Point charge $Q=0.2 \mu\text{C}$ placed at origin, find electric field intensity at $(0,6,8)\text{m}$. (05) |
| d) | Define scalar and vector quantity with example. Also state coulomb's law. (05) |
| e) | State and derive the polarization of a dielectric materials. (05) |
| Q. 2 | a) Define Biot-Savart's Law & use it to derive expression for magnetic field intensity due to infinite wire carrying current I. (10) |
| Q. 2 | b) Show that the \vec{E} due to infinite sheet of charge at a point is independent of the distance of that point from the plane containing the charge. (10) |
| Q. 3 | a) An infinite long current filament is placed along z-axis. The magnetic field intensity at point $P(6,8,0)$ is $10(-1.6\vec{a}_x + 1.2\vec{a}_y) \text{ A/m}$. Find current through the filament. (10) |
| Q. 3 | b) Derive Maxwell's second equation in both integral and point form. (10) |
| Q. 4 | a) Formulate electromagnetic wave equation from Maxwell's equation for dielectric medium. (10) |
| Q. 4 | b) Find \vec{D} , \vec{B} and \vec{H} displacement current density in free space, given $\vec{E} = E_m \sin(\omega t - \beta z)\vec{a}_y$. (10) |
| Q. 5 | a) Prove that $\vec{E} = -\nabla V$. Also derive the Poission's and Laplace equation. (10) |
| Q. 5 | b) In Cartesian co-ordinate a potential is a function of x only. At $x = -2 \text{ cm}$, $V = 25 \text{ V}$ and $\vec{E} = -1.5 \times 10^3 \vec{a}_x \text{ V/m}$ throughout the region. Find V at $x=5 \text{ cm}$. (10) |
| Q. 6 | a) Draw rectangular, cylindrical and spherical co-ordinate system and explain differential element dl , differential surface ds and differential volume dv for all coordinate system (10) |
| Q. 6 | b) A Charge $Q_1 = -20\mu\text{C}$ is placed at $P(-6,4,6) \text{ m}$ and a charge $Q_2 = 50\mu\text{C}$ is placed at $R(5,8,-2) \text{ m}$ in free space. Calculate the exerted force on Q_2 by Q_1 in vector form. (10) |