



VIT

Vellore Institute of Technology

Fall Semester: 2023

Course Code & Name: BECE205L – Engineering Electromagnetics

Slot: D2

Continuous Assessment Test – I

Programme Name & Branch: B.Tech & ECE

Exam Duration: 90 Min.

Maximum Marks: 50

S.No.

Answer ALL the questions.

Question

- (i) If $\mathbf{A} = 3\mathbf{a}_r + 2\mathbf{a}_\theta + 6\mathbf{a}_\phi$ and $\mathbf{B} = 4\mathbf{a}_r + 3\mathbf{a}_\theta$, determine
(a) the angle between $\mathbf{A}$ and $\mathbf{B}$
(b) the angle between $\mathbf{B}$ and ϕ axis.

Marks CO BT

5 1 L1

- (ii) Find the total charge contained in a volume defined by the surface $1 < r < 2$, $\pi/2 < \theta < 2\pi/3$, $\pi/6 < \phi < \pi/2$, if $\rho_v = 20r\phi$ mC/m³.

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A point charge 100 pC is located at (4, 1, -3) while the x-axis carries charge 2 nC/m. If the plane $z = 3$ also carries 5 nC/m², Find $\mathbf{E}$ at (1, 2, 3).

10 1 L2

If potential $V = \frac{\cos 2\phi}{\rho}$ volt in free space, find (a) the volume charge density at point A (0.5m, 60°, 2m). (b) surface charge density on the conductor surface passing through the point B (2m, 30°, 1m).

10 1 L3

Two dielectric medium region 1 ($x < 4$ cm) and region 2 ($x > 4$ cm) have dielectric constant 3.5 and 1.5. If $\mathbf{D}_1 = 3\mathbf{a}_x - 4\mathbf{a}_y + 5\mathbf{a}_z$ nC/m², find

10 1 L3

- (a) $\mathbf{E}_2$ and $\mathbf{D}_2$
(b) Polarization field $\mathbf{P}_2$
(c) Energy Densities in each region

(a) A small current element of $1.2 \times 10^{-5} \hat{\mathbf{a}}_x$ A/m is located at (2, -2, 0). Find the magnetic field intensity at origin.

5 2 L3

(b) Two infinite current sheets with $\mathbf{K} = 10\hat{\mathbf{a}}_z$ mA/cm are placed at $x = -2$ cm and $x = 4$ cm. Calculate the total magnetic field strength at $x < -2$ cm and $x > 4$ cm.

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