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Vellore Institute of Technology

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Reg. No

SLOT: F1

SCHOOL OF ELECTRONICS ENGINEERING

CONTINUOUS ASSESSMENT TEST – I

FALL SEMESTER 2025--2026

Programme Name & Branch: B. Tech - ECE

Course Code and Course Name: BECE205L -- Engineering Electromagnetics

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Class Number(s): VL2025260100503, 0529, 2614, 2624, 2620

Exam Duration: 90 minutes **Maximum Marks:** 50 **Date of Exam:** 22-08-2025 FN

General instruction(s):
- Answer All Questions
- BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply)
- Course Outcomes
  a. CO1: Analyse the co-ordinate system transformation.
  b. CO2. Evaluate and analyse Electric Fields & Electric Potential due to different Charge distributions.

Answer all the questions (5 x10 = 50 Marks)

Q. No	Question	Max Marks	CO	BL
1	(i) Given $\boldsymbol{A} = 2\boldsymbol{a}_x + 4\boldsymbol{a}_y$ and $\boldsymbol{B} = 6\boldsymbol{a}_y - 4\boldsymbol{a}_z$, find the (a) angle between **A** and **B** (b) unit vector of **A** (ii) Calculate the gradient of the following scalar field $f(\rho,\phi,z)$ and evaluate the gradient at the specified point $P(3,90°,-4)$. $f(\rho,\phi,z) = 3\rho\sin\phi + \rho z$	10	CO1	BL3
2	A point P_1= (0, -4, 3) and a vector **A** = $\frac{x\,a_x + y a_y}{(x^2+y^2)}$ are defined in Cartesian coordinates. Express P_1 and vector **A** in cylindrical coordinates and evaluate **A** at P_1.	10	CO1	BL3
3	In a given free space region calculate the total electric field intensity at the origin, due to various charge distribution mentioned below: (i) a 12 nC charge at (2,0,6) (ii) a 3 nC/m of straight filament of charges at the intersection of planes x = -2, y = 3 and (iii) a surface charge distribution with density of 0.2 nC/m^2 in x = 2 plane.	10	CO2	BL3
4	(a) Two large, parallel conducting plates are 12 cm apart and have charges of equal magnitude and opposite sign on their facing surfaces. An electrostatic force of 3.9×10^{-15} N acts on an electron placed anywhere between the two plates. (Neglect fringing.) (a) Find the electric field at the position of the electron. (b) What is the potential difference between the plates? (b) In a dielectric material of relative permittivity ε_r = 5.0 the potential field is defined as **V=10x^{3}yz-10z^2** V, determine polarization field vector **P** and polarization volume charge density ρ_{pv} at origin.	4 6	CO2	BL3
5	Consider the two conducting parallel plates positioned at z=0 and z=2 mm with voltage V = 0 and V = 50 V respectively. Determine electric flux density D in the dielectric region (ε_r = 1.5) between the plates and surface charge density ρ_s on the both plates. Use Laplace equation for solving.	10	CO2	BL3