Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Make-up Examinations – December 2025

Date: 27 – 12- 2025 **Time:** 01:00pm – 04:00pm

School: SOE	**Program**: Electronics and Communication	
Course Code : ECE3004	**Course Name:** Electromagnetic Theory	
Semester: MK	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**10**	**30**	**30**	**10**	**20**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	What are the unit vectors in the Spherical Coordinate system?	**2 Marks**	**L1**	**CO1**
2.	Find the gradient of the function V= $2x^2$-$3y^2$+z^2	**2 Marks**	**L2**	**CO2**
3.	Given a vector $\vec{A} = 4\widehat{a_x} + \widehat{a_y} - 1\widehat{a_z}$ find the unit vector	**2 Marks**	**L2**	**CO1**
4.	Write down the mathematical form of Stoke's theorem.	**2 Marks**	**L1**	**CO2**
5.	Define Scalar and Vector Quantity with two examples each	**2 Marks**	**L1**	**CO1**
6.	Write down the differential form of the Gauss's law for both electrostatics and magneto statics	**2 Marks**	**L2**	**CO5**
7.	What do you mean by an irrational vector?	**2 Marks**	**L1**	**CO1**
8.	Find the angle θ between the vectors $\vec{P} = \hat{a}_x - \hat{a}_y + \hat{a}_z$ and $\vec{Q} = \hat{a}_x - 2\hat{a}_y + \hat{a}_z$	**2 Marks**	**L2**	**CO1**
9.	Write the mathematical form of Faraday's law	**2 Marks**	**L1**	**CO4**
10.	Give the statement of Gauss's law	2 Marks	L1	CO2

Part B

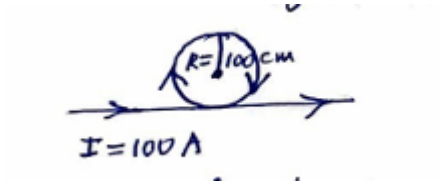
Answer the Questions. **Total Marks 80M**

11.	**a.**	State and Explain Coulomb's law. Clearly indicate unit of quantities used in the force equation.	**2 Marks**	**L1**	**CO2**
	b.	Find Electric field intensity at p(0,0,0)due to Q=-3C and Q2=5C are located in free space	**8Marks**	**L2**	**CO2**
		Or			
12.	**a.**	Given the $\mathbf{D} = \frac{5z3}{2}\,\mathbf{a_z}\,\mathbf{C/m^2}$ .Prove Gauss's Divergence Theorem for the given vector, where 0<x,y,z<1.	**8Marks**	**L2**	**CO2**
	b.	Calculate the divergence of vector D at specified points $D = y^2z^2\,\mathbf{a_x} + 2xyz^3\,\mathbf{a_y} + 3xy^2z^2\,\mathbf{a_z}$ at P(3,2,1)	**2 Marks**	**L2**	**CO2**

13.	**a.**	State Gauss Divergence Theorem.	**2Marks**	**L1**	**CO3**
	b.	If the magnetic field intensity $\vec{H}$ on a plane $z = 1$ is given by $\vec{H} = -y(x^2 + y^2)\hat{a}_x + x(x^2 + y^2)\hat{a}_y + \sin z\ \hat{a}_z$. Find the net current enclosed by the rectangular region bounded by $-1 \le x \le 1$ and $-2 \le y \le 2$ using Ampere's circuital law.	**8Marks**	**L3**	**CO4**
		Or			
14.	**a.**	State Greens Theorem	**2 Marks**	**L1**	**CO2**
	b.	Evaluate $\oint(2x^2 - y^2)dx + (x^2 + y^2)dy$ using Greens's Theorem were C is the boundary enclosed by line x=0 y=0 x=2 y=3	**8Marks**	**L3**	**CO2**

15.	**a.**	Suppose the magnetic flux density is given by $B = -10x\hat{\boldsymbol{a}}_x + \beta y\hat{\boldsymbol{a}}_y + 10\hat{\boldsymbol{a}}_z$T where β is an unknown constant. Using Gauss's law of magnetostatics, evaluate β	**5Marks**	**L2**	**CO4**
	b.	A 2-D electric field is given by $E = 2x^2\mathbf{a}_x + 4x^2\mathbf{a}_y$ **V/m.** Show that field cannot arise from static distribution	**5Marks**	**L2**	**CO4**
		Or			
16.	**a.**	Calculate the divergence of vector D at specified points $D = y^2z^2\,\mathbf{a_x} + 2xyz^3\,\mathbf{a_y} + 3xy^2z^2\,\mathbf{a_z}$ at P(3,2,1)	**8Marks**	**L**	**CO3**
	b.	If the electric field in a travelling electromagnetic wave has a peak value of 4500 V /m .What is the peak strength of the magnetic field in this wave?	**2Marks**	**L**	**CO5**

17.	**a.**	Points P and Q are located at (0,2,4) and (3,-1,5) respectively. Find (i) The position vector P (ii) The distance vector from P to Q (iii) the distance between P to Q (iv) A vector parallel to PQ with magnitude of 5	**5Marks**	**L2**	**CO1**
	b.	If $\vec{A} = 3\widehat{a_x} + 4\widehat{a_y} + \widehat{a_z}$ and $\vec{B} = 3\widehat{a_x} - \widehat{a_y}$ find the dot and cross product	**5Marks**	**L2**	**CO1**
		Or			
18.	**a.**	Given point P(-2,6,3) express P in cylindrical and spherical coordinate system	**5Marks**	**L1**	**CO1**
	b.	If $\vec{A} = 5\widehat{a_x} + 3\widehat{a_y} - 6\widehat{a_z}$ and $\vec{B} = 3\widehat{a_x} - \widehat{a_y}$, find the (i)components of $\vec{A}$ along $\widehat{a_y}$ (ii)the magnitude of $2\vec{A} - \vec{B}$ and (iii) unit vector along of $\vec{A} + 2\vec{B}$	**5Marks**	**L1**	**CO1**

19.	**a.**	. State and Explain Biot Savart's law	**10 Marks**	**L2**	CO3
	b.	Determine the magnetic field in the figure 	**10 Marks**	**L2**	**CO4**
		Or			
20.	**a.**	Convert the Maxwell's equation from point form to integral form. And Briefly explain concepts from which Maxwell's equation are derived.	**15 Marks**	**L2**	**CO5**
	b.	The magnetic field at point in space is H= $4x\widehat{a_x} + 2K\widehat{a_y} + 8\widehat{a_z}$ .Find the value of K using Gauss law for magnetic field.	**5marks**	**L2**	**CO5**

21.	**a.**	Write down the four Maxwell's equations in the differential and integral form. Then elaborate the physical significance of each of these forms in details.	**20 Marks**	**L2**	**CO5**
		Or			
22.	**a.**	A square coil of area (20cm X 20cm) of wire consists of 50 turns . The magnetic field is perpendicular to the face of the coiland increases from -3T to 5T in 0.1 seconds .The coil is connected across a 20 ohm resistor. Determine i) emf induced in the coil ii) current through the resistor iii) power dissipated by the resistor.	**20 Marks**	**L2**	**CO4**