Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 4 – EXAMINATION – SUMMER 2026

Subject Code: BE04000301 **Date: 02/06/2026**

Subject Name: Electromagnetics

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Represent spherical coordinate system with neat sketch indicating coordinates and unit vectors & write differential lengths, areas and volume.	**03**
	(b)	Two vectors extending from origin are v_1= (7,3,-2) and v_2= (-2,7,-3) then find (a) a unit vector perpendicular to both v_1 and v_2 (b) area of triangle defined by v_1 and v_2.	**04**
	(c)	An infinite long uniform line charge with density 30 nC/m is lying along y=3 and z=5. Determine E at point P (5,6,1) due to this line charge.	**07**
Q.2	**(a)**	Define divergence of a vector A and briefly explain it with examples.	**03**
	(b)	Calculate the work done in moving a 3 C charge from B(1,3,5) to A(2,0,3) along the straight-line segments joining (1,3,5) to (2,3,5) to (2,0,5) to (2,0,3) in the electric field E = y a_x V/m.	**04**
	(c)	A volume is defined by 1< x,y,z < 1.2 in free space. If D = $2x^2y$ ax + $3x^2y^2$ ay C/m^2 then determine total flux leaving the closed surface using Gauss's law.	**07**
		OR	
Q.2	**(c)**	Describe boundary conditions at conductor-free space interface.	**07**
Q.3	**(a)**	State and prove divergence theorem.	**03**
	(b)	Calculate volume charge density using poisson's equation if potential at point P(1,2,3) is given by V =4yz/(1+x^2) Volts.	**04**
	(c)	Three infinite uniform sheet charges are located in free space as 3 nC/m2 at z= - 4, 6 nC/m2 at z=1 and -8 nC/m2 at z=4. Then find electric field at point P(-1,-5,2).	**07**
		OR	
Q.3	**(a)**	Find equation of streamline passing through point P(1,4,-2) in the field E = (-8x/y)a_x + ($4x^2/y^2$)a_y .	**03**
	(b)	Calculate $\nabla \cdot D$ at point P(-2,3,5) if D= $1/z^2$[10xyz a_x + $5x^2z$ a_y + ($2z^3$ – $5x^2y$) a_z].	**04**
	(c)	Apply Gauss's law to a differential volume and derive its point form as maxwell's first equation.	**07**
Q.4			

	(a)	If $V= (v_0. \rho /d).\cos\phi$ in cylindrical system then check wheter it satisfies Laplace equation or not.	**03**
	(b)	State significance of Poisson's and Laplace equations and derive them.	**04**
	(c)	Discuss boundary conditions for dielectric-dielectric interface.	**07**
		OR	
Q.4	**(a)**	Define: magnetic flux density, scalar magnetic potential, vector magnetic potential.	**03**
	(b)	State and explain Stoke's theorem.	**04**
	(c)	Define curl of vector A and derive point form of Ampere's circuital law.	**07**
Q.5	**(a)**	Briefly explain retarded potential.	**03**
	(b)	State Faraday's law and derive its point form.	**04**
	(c)	Write Maxwell's equations in point form for static and time varying conditions and state their significance.	**07**
		OR	
Q.5	**(a)**	Briefly explain displacement current.	**03**
	(b)	Describe wave motion in free space.	**04**
	(c)	Define poynting vector and derive its theorem.	**07**

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