

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019****Subject Code: 2163203****Date: 06/12/2019****Subject Name: Engineering Electromagnetics And Wave Propagation****Time: 02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		MARKS
Q.1	(a) What are the Coordinate systems used in Electromagnetic Engineering. Explain any one Coordinate System in Brief.	03
	(b) The three vertices of a triangle are located at A(6,-1,2), B(-2,3,-4), and C(-3,1,5). Find (a) R_{AB} (b) R_{AC} (c) The angle θ_{BAC} at vertex A	04
	(c) Derive Maxwell's four equations in Integral and Point form.	07
Q.2	(a) Calculate the Electric force on a 10 nC charge located at (0, 3, 1) due to Point charges of 1 mC located at (3, 2,-1)	03
	(b) State and Prove the Gauss's law.	04
	(c) Derive the expression for the Electric Field intensity E due to infinite line of charge having a uniform density of ρ_l C/m ²	07
	OR	
	(c) Define Current and Current Density and Derive Continuity of Current Equation.	07
Q.3	(a) A uniform line charge of 10 nC/m is lying along z –axis. Find E and D at $r=3m$.	03
	(b) Explain Hall voltage & Hall effect and mention its uses.	04
	(c) State Ampere's Circuital law & Derive the expression for Curl of Magnetic field intensity	07
	OR	
Q.3	(a) Write down short notes on Isolated Spherical Capacitor.	03
	(b) State and Prove Stoke's Theorem with necessary Equation.	04
	(c) Define Lorentz Force Equation. The point charge $Q = 18$ nC has a velocity 5×10^6 m/s in the direction $a_v = 0.60 a_x + 0.75 a_y + 0.30 a_z$. Calculate the magnitude of the force exerted on the charge by the field (i) $B = -3 a_x + 4 a_y + 6 a_z$ mT (ii) $E = -3 a_x + 4 a_y + 6 a_z$ kV/m (iii) B and E acting together	07
Q.4	(a) Find out relationship between E and V.	03
	(b) Explain Faraday's law of EM induction and direction of e.m.f	04
	(c) Prove that for a differential current loop which carries current I in a given magnetic field B, the torque on loop is given by $dT = dm \times B$	07
	OR	
Q.4	(a) Evaluate a Poisson's and Laplace's Equations.	03
	(b) Determine volume charge density ρ_v associated with electric Flux Density $D = 4xy/z a_x + 2x^2/z a_y - 2x^2y/z^2 a_z$	04
	(c) Write the property of Conductor and Determine boundary conditions at a boundary between a conductor and free space	07

- Q.5 (a) Define Poyting Vector and Explain its Significance with necessary Equation. **03**
- (b) Write a short note on nature of Magnetic Materials. **04**
- (c) What do you mean by Electric Dipole? Derive the expression for Electric field intensity E at due to the Electric Dipole. **07**

OR

- Q.5 (a) Write a short note on polarization of waves. **03**
- (b) State and Explain Uniqueness theorem **04**
- (c) Given the electric flux density, $D = 0.3r^2 a_r$ nC/m² in free space: **07**
- (i) Find E at point $P(r = 2, \theta = 25^\circ, \phi = 90^\circ)$;
- (ii) Find the total charge within the sphere $r = 3$;
- (iii) Find the total electric flux leaving the sphere $r = 4$

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