GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– V (OLD) EXAMINATION – SUMMER 2019

Subject Code: 151002   **Date: 31/05/2019**
Subject Name: Engineering Electromagnetics
Time: 02:30 PM TO 05:00 PM   **Total Marks: 70**

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

Q.1	**(a)**	Define Coulomb's law. Derive the expression for the intensity of electric field due to a line charge along the Z direction with uniform charge density ρ_L c/m.	**07**
	(b)	State and prove Uniqueness theorem.	**07**
Q.2	**(a)**	Derive the expression of gradient of scalar field in all the systems and list computational formulas on gradient.	**07**
	(b)	Given point P(-2,6,3) and vector A= ya_x + $(x + z)a_y$, express P in cylindrical and Spherical coordinates. Evaluate A at P in the Cartesian and Cylindrical systems.	**07**

OR

	(b)	Determine the divergence of these vector fields.	**07**

   i) $P = x^2yz\ a_x + x\ z\ a_z$
   ii) $Q = \rho \sin\emptyset\ a_\rho + \rho^2 z\ a_\emptyset + z \cos\emptyset\ a_z$
   iii) $T = 1/r^2 \cos\theta\ a_r + r \sin\theta \cos\emptyset\ a_\theta + \cos\theta\ a_\emptyset$

Q.3	**(a)**	Define electric dipole. Derive expression for electric field intensity at point 'P' at distance 'r' from center of dipole at origin along Z axis	**07**
	(b)	Describe the electric boundary condition between free space and conductor. Explain the importance of boundary condition.	**07**

OR

Q.3	**(a)**	Write Maxwell's equation in point and integral form, also explain its significance.	**07**
	(b)	Derive Poisson's and Laplace's equations and states their applications.	**07**
Q.4	**(a)**	State Ampere's circuit law and derive the expression for curl of magnetic field intensity.	**07**
	(b)	State and derive Biot- Savart's law	**07**

OR

Q.4	**(a)**	Using Ampere's circuit law, derive an expression for H due to infinite sheet of current.	**07**
	(b)	Explain Faraday's law in detail with neat diagram.	**07**
Q.5	**(a)**	Define lossy dielectric medium. Derive expression for attenuation constant and phase constant for the same.	**07**
	(b)	A parallel plate capacitor with plate area of 5 cm^2 and plate separation of 3mm has a voltage of 50 sin10^{3}t V applied to its plates. Calculate the displacement current assuming $\varepsilon = 2\varepsilon_0$.	**07**

OR

Q.5	**(a)**	State and derive Poynting's theorem.	**07**
	(b)	In a nonmagnetic medium	**07**

   E= 4 sin(2π X 10^{7}t – 0.8x) a$_z$ V/m
   Find
   1) ε_r, η
   2) The time average power carried by the wave.
   3) The total power crossing 100 cm^2 of plane 2x + y =5

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