

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (Old) EXAMINATION – WINTER 2019****Subject Code: 151002****Date: 04/12/2019****Subject Name: Engineering 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.

- Q.1** (a) Explain Cylindrical co-ordinate system with a neat sketch giving details of their unit vectors and point form and vector form representations. **07**
- (b) Define curl and give its physical interpretation. Also give relation of curl in all three co-ordinate system. **07**
- Q.2** (a) State Coulomb's law and give its mathematical expression. From that deduce expression of electric field intensity **E** for point charges. **07**
- (b) Find Electric Field Intensity **E** at a point on Z-axis, due to circular ring charge with charge density ρ_L C/m present in XY plane. **07**
- OR**
- (b) State and prove divergence theorem. Relate Gauss's law with divergence theorem. **07**
- Q.3** (a) State & explain the Biot-Savart's Law and derive the necessary equations of Magnetic field Intensity **H**. **07**
- (b) A circular loop located on $X^2 + Y^2 = 9, Z=0$ carries a current of 10 A along \hat{a}_ϕ . Determine **H** at (0,0,4) and (0,0,-4). **07**
- OR**
- Q.3** (a) A circular current carrying loop is lying on x-y plane. Derive the equation of Magnetic field intensity **H** on the axis of a circular loop. Also find **H** at the center of the loop. **07**
- (b) Evaluate Stoke's theorem for the field $\mathbf{H} = 6xy \hat{a}_x - 3y^2 \hat{a}_y$ amp/meter if rectangular path around the region is $2 \leq x \leq 5, -1 \leq y \leq 1$ and $z=0$. Also find out current I. **07**
- Q.4** (a) Derive electrostatic Boundary conditions for Dielectric to Dielectric interface. **07**
- (b) Find the potential and volume charge density at P (0.5, 1.5, 1) in free space if potential field is given as $V = 6 \rho \phi z$. **07**
- OR**
- Q.4** (a) A boundary exist at $z=0$ between two dielectric. $\epsilon_{r1} = 2.5$ in region $z < 0$. $\epsilon_{r2} = 4$ in region $z > 0$. The electric field in the region of ϵ_{r1} is $\mathbf{E}_1 = -30 \hat{a}_x + 50 \hat{a}_y + 70 \hat{a}_z$ V/m. then find out
- i. Normal component of E_1
 - ii. Tangential component of E_1
 - iii. Angle Θ_1 between E_1 and normal to the surface
 - iv. Normal component of D_2
 - v. Tangential component of D_2
 - vi. Angle Θ_2 between E_2 and normal to the surface
- (b) Define Torque. Derive the equation of Torque on a close current carrying loop which is placed in steady magnetic field. **07**
- Q.5** (a) Derive Maxwell's equations in point and Integral form for time varying fields. **07**
- (b) Derive the equation of Capacitance (C) and Energy stored (W) for parallel plate capacitor. **07**
- OR**
- Q.5** (a) Explain wave propagation in free space with necessary equations. **07**
- (b) Derive point form of Ampere's Circuital Law. **07**
