Enrolment No._

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V(New) • EXAMINATION - WINTER 2016 Subject Code:2151002 Date:24/11/2016 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. MARKS 0.1 14 Answer the following. For spherical coordinate system find surfaces of ϕ constant and θ 1 constant. Why the divergence of curl of any vector is zero? 2 In coaxial cable the maximum field is at_____ 3 4 Find the result of dot product $a_v \cdot a_{\theta}$ 5 Define the gradient. 6 Write the continuity equation. 7 What is poynting vector? Eight point charges of 1nC are symmetrically located on the circle of 8 1m radius; Find the electric field intensity at the center of the circle. 9 What is Hall voltage? 10 The work done in moving the charge around any closed loop is _____. For the cylindrical system, dv= 11 Given 80 µC point charge located the origin, the total electric flux 12 passing through that portion of the sphere r=10 cm bounded by $0 < \theta < \pi/2$ and $0 < \phi < \pi/2$ is The point form of Gauss's law is _____. 13 For time varying field $\Delta \times H =$ 14 Q.2 Define the divergence and write down its applications. 03 **(a)** Using the coordinate system named give the vector at point P(2,-1,-3)04 **(b)** that extends to Q(1,3,4) (i) Cartesian (ii) Cylindrical. What is electric field intensity? Derive the equation of electric field (c) 07 intensity due to infinite length line charge. OR What is the use of coordinate systems? Explain the spherical 07 (c) coordinate system. (a) Explain the electric filed intensity due to volume charge density with **Q.3** 03 one practical example. Write Maxwell's equations in integral form and explain their physical **(b)** 04 significance. A uniform line charge density 20 nC/m lies on the z axis between z =07 (c) 1 and z = 3m. No other charge present. Find E at (i) Origin and (ii) P(4,0,0). OR (a) Explain the divergence theorem. 03 0.3 (b) What is dipole? Derive the expression of electric field intensity due to 04 an electric dipole.

(c) A line charge density 24 nC/m is located in free space on the line y = 071, z = 2. (i) Find E at P (6,-1,3). (ii) What point charge Q_A should be located at Q(-3,4,1) to cause E_y to be zero at P.

- Q.4 (a) Given that $D = z\rho \cos^2 \phi a_z C/m^2$, calculate the charge density at (1, 45⁰,3) and the total charge enclosed by the cylinder of radius 1 m with $-2 \le z \le 2$ m.
 - (b) Given the potential $V = (10/r^2) \sin\theta \cos\phi$, (i) Find D at P(2, 90⁰,0⁰) and 04 at Q(1, 0⁰, 90⁰).
 - (c) What is the use of boundary condition? Find the electric filed 07 boundary condition between conductor and dielectric.

OR

- Q.4 (a) Uniform surface charge densities 100, -60 and 50 μ C/m² lie in the x = 0, y = 0 and z = 0 planes, respectively. Find magnitude of D at points 2.5m from every coordinate plane in each of the eight octants.
 - (b) A potential field is expressed as $V = (50\rho^2 \cos \phi)/(z+1) v$. Given a **04** point P(4, 30⁰,2) in free space , find at P (i)V, E and (ii) ρ_v .
 - (c) Derive the magnetic boundary condition between to magnetic 07 materials.

Q.5 (a) Explain the polarization and magnetization.

- (b) Explain the stoke's theorem
- (c) A surface current density K = 20 a_y A/m, flows in the y = 0 plane **07** through the region -5 < z < 5 m and $-\infty < x \infty$, Find H at P (0,10,0) in free space.

OR

Q.5 (a) Explain the wave motion in free space.
(b) Explain the retarded and vector magnetic potential.
(c) A circular ring. ρ = 2 m, z = 1 m, carries a uniform charge density of 8 nC/m, and the plane z = 0 is perfectly conducting. Assume the region z > 0 is free space. find V at P (0,0,z,), z > 0.

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