

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VI (NEW) - EXAMINATION – SUMMER 2016****Subject Code:2163203****Date:09/05/2016****Subject Name: Engineering Electromagnetics & wave Propagation****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. Bold letter represent vector quantity.

- Q.1** (a) Explain Cross product and Dot product in detail with applications of each. **07**  
 (b) Transform each of the following vectors to cylindrical coordinates at the points specified: (a)  $5 \mathbf{a}_x$  at  $P(\rho = 4, \phi = 120^\circ, z = -1)$ ; (b)  $5 \mathbf{a}_x$  at  $Q(3, 4, -1)$ ; (c)  $4 \mathbf{a}_x - 2 \mathbf{a}_y - 4 \mathbf{a}_z$  at  $(2, 3, 5)$ . **07**
- Q.2** (a) Derive expression for electric field intensity at any point due to a line charge density with uniform charge density  $\rho_l$  C/m on the infinitely long z axis. **07**  
 (b) State the following: (1) Coulomb's law (2) Gauss's law (3) Ampere's law. **07**
- OR**
- (b) Calculate vector  $\mathbf{E}$  at  $M(3, -4, 2)$  in free space caused by: (a) a charge  $Q_1 = 2 \mu\text{C}$  at  $P_1(0,0,0)$ ; (b) a charge  $Q_2 = 3 \mu\text{C}$  at  $P_2(-1,2,3)$ ; (c) a charge  $Q_1 = 2 \mu\text{C}$  at  $P_1(0,0,0)$  and a charge  $Q_2 = 3 \mu\text{C}$  at  $P_2(-1,2,3)$ . **07**
- Q.3** (a) Derive the expression for divergence of vector  $\mathbf{D}$ . **07**  
 (b) Derive Maxwell's four equations in integral form for static conditions. **07**
- OR**
- Q.3** (a) Derive the expression for potential field of a dipole. **07**  
 (b) Derive Maxwell's four equations in point form for static conditions. **07**
- Q.4** (a) Write a short note on conductor free space boundary conditions. **07**  
 (b) Derive the expression for point form of Ampere's circuital law. **07**
- OR**
- Q.4** (a) State and prove uniqueness theorem. **07**  
 (b) Write a short note on magnetic boundary conditions. **07**
- Q.5** (a) State and explain Stoke's theorem. **07**  
 (b) Find  $V$  at point  $P(2,1,3)$  for the field of: (a) two coaxial conducting cylinders,  $V = 50 \text{ V}$  at  $\rho = 2 \text{ m}$  and  $V = 20 \text{ V}$  at  $\rho = 3 \text{ m}$ ; (b) two radial conducting planes,  $V = 50 \text{ V}$  at  $\phi = 10^\circ$  and  $V = 20 \text{ V}$  at  $\phi = 30^\circ$ . **07**
- OR**
- Q.5** (a) Define Uniform Plane Wave and explain Skin Effect in detail. **07**  
 (b) A 9375 MHz uniform plane wave is propagating in polystyrene ( $\epsilon_r = 2.56$ ,  $\mu_r = 1$ ). If the amplitude of electric field intensity is 20 V/m and the material is assumed to be lossless, find (a) Phase constant; (b) The wavelength (in the polystyrene); (c) Velocity of propagation; (d) The intrinsic impedance. **07**

\*\*\*\*\*