Seat No.: _____

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Sub	oject	GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER–V (NEW) - EXAMINATION – SUMMER 2016 Code:2151002 Date:06/05/201	6	
Subject Name:Engineering Electromagnetics Time:02:30 PM to 05:00 PM Total Marks Instructions:			s: 70	
	1. 2. 3.	Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.		
Q.1	(a)	Explain Following: (1)The Dot Product, (2) The Cross Product	07	
	(b)	Given point P(-2,6,3) and vector $\mathbf{A} = y\mathbf{a}_x + (x+z)\mathbf{a}_y$, Express P and A in Spherical Coordinates. Evalute A at P in Spherical coordinate system,	07	
Q.2	(a)	 (I) Define Electric field strength. (II) Point charges 1 mC and -2 mC are located at (3, 2,-1) and (-1,-1, 4), respectively. Calculate the electric force on a 10 nC charge located at (0, 3, 1) and the electric field intensity at that point. 	02 05	
	(b)	(I) What do you mean by Electric Flux Density.(II) Determine an equation for the electric fields due to volume charge distribution.	02 05	
	(b)	OR The finite sheet $0 \le x \le 1, 0 \le y \le 1$ on the $z = 0$ plane has a charge density $\rho_s = xy(x^2+y^2+25)^{3/2}$ nC/m ² .Find (1) The total charge on the sheet (2) The electric field at (0,0,5) (3) The force experienced by a -1 mC charge located at (0,0,5).	07	
Q.3	(a)	(I) Write short notes on electric potential. (II) Two point charges -4μ C and 5 μ C are located at (2, -1, 3) and (0, 4, -2), respectively. Find the potential at (1, 0, 1), assuming zero potential at infinity.	02 05	
	(b)	(I) Find out relationship between E and V .that is, the electric field intensity is the gradient of V. (II) Given the potential $v = \frac{10}{r^2} \sin \theta \cos \Phi$, find the electric flux density D at	04 03	
		(2,π/2,0) · · · · · · · · · · · · · · · · · · ·		
Q.3	(a)	If $\mathbf{J} = \frac{1}{r^3} (2 \cos \theta \mathbf{a}_r + \sin \theta \mathbf{a}_\theta) \text{A/m}^2$, calculate the current passing through (I) a hemispherical shell of radius 20 cm, $0 < \theta < \pi/2$, $0 < \phi < 2\pi$ (II) A spherical shell of radius 10 cm.	07	

	(b)	Derive continuity of current equation. Determine relaxation time for copper where $\sigma=5.8\times10^{-7}$ S/m, ϵ_r =1	07
Q.4	(a)	Evaluate a Poisson's and Laplace's Equations.	07
	(b)	Write down short notes on Spherical Capacitor. OR	07
Q.4	(a)	Evaluate H , Magnetic field intensity for the case of infinite sheet of current.	07
	(b)	Given the magnetic potential A = $-\rho^2/4$ a _z Wb/m,calculate the total magnetic flux crossing the surface $\Phi = \pi/2$, $1 \le \rho \le 2$ m, $0 \le z \le 5$	07
Q.5	(a)	Write short notes on magnetic boundary conditions between two different media.	07
	(b)	Determine EMF for the following cases: (1) Moving loop in static B field (2) Moving loop in time varying field OR	07
Q.5	(a)	Give details on plane waves in free space. Draw a plot of E and H as function of z at $t = 0$.	07
	(b)	A uniform plane wave propagating in a medium has $E = 2 e^{-\alpha z} \sin(10^8 t - \beta z) a_y$ V/m,If the medium is characterized by $\varepsilon_r = 1, \mu_r = 20$ and $\sigma = 3$ S/m.Find $\alpha, \beta, \mathbf{H}$.	07
