GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2018

Subject Code: 2163203   **Date: 01/05/2018**
Subject Name: Engineering Electromagnetics & wave Progogation
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)**	Transform the given vector **A**=10 a_z into spherical coordinates at Point P (r=4, θ=110°, Ø=120°).	**03**
	(b)	Explain cross product and dot product in detail.	**04**
	(c)	Explain cylindrical coordinate systems.	**07**
Q.2	**(a)**	Define volume surface and line charge density.	**03**
	(b)	Explain coulombs law and field intensity.	**04**
	(c)	Given the field D = 6ρsin (φ /2) a_p+ 1.5ρcos (φ /2) a_φ C/m^2. Evaluate both sides of the divergence theorem for the region bounded by ρ= 2, 0 < φ < 180°, 0 < z < 5.	**07**

OR

	(c)	Find E at P (1, 5, 2) in free space if a point charge of 6 μC is located at Q(0, 0, 1), a uniform line charge of 180 nC/m lies along the z axis and a uniform sheet charge 25 nC/m^2 lies in the plane z = -1	**07**
Q.3	**(a)**	What do you mean by equipotential surface?	**03**
	(b)	State and prove maxwell's first law in integral form.	**04**
	(c)	Derive the equation to find energy stored in the field of a system of charges.	**07**

OR

Q.3	**(a)**	Find the gradient of the following scalar field = e^{-z} sin 2x cosh y.	**03**
	(b)	If V = 2 volts at x = 1mm and V = 0 volts at x = 0. Find Ex at x = 1 mm in free space for the volume charge density $-3×10^8$ ε_0 x C/m^3.	**04**
	(c)	Write short note on boundary condition for perfect dielectric.	**07**
Q.4	**(a)**	Derive the expression of following capacitor: 1) coaxial 2) Spherical	**03**
	(b)	Derive Poission's and Laplace's equation.	**04**
	(c)	Write short note on magnetic boundary conditions	**07**

OR

Q.4	**(a)**	Explain biot-savart law.	**03**
	(b)	Explain ampere's circuital law	**04**
	(c)	Verify Stoke's theorem for the field **H** = $6xy a_x$ – $3y^2$ a_y and the rectangular path around the region 2 ≤ x ≤5, -1 ≤ y ≤1 and z = 0. Let the positive direction of **ds** be a_z.	**07**
Q.5	**(a)**	Derive an equation of force on moving charge under effect of EM field.	**03**
	(b)	Explain wave motion in free space.	**04**
	(c)	Explain point and integral form of Maxwell's equations.	**07**

OR

Q.5	**(a)**	Define with respect to plane EM waves: 1) Phase 2) Phase constant 3) Phase velocity	**03**
	(b)	Explain skin effect.	**04**
	(c)	State and prove pointing vector theorem.	**07**