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 $\mathbf{A}=10\ \mathbf{a_z}$ into spherical coordinates at Point P ($r=4$, $\theta=110°$, $\varnothing=120°$).	**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 $D = 6\rho\sin(\varphi/2)\ a_\rho + 1.5\rho\cos(\varphi/2)\ a_\varphi\ C/m^2$. Evaluate both sides of the divergence theorem for the region bounded by $\rho= 2$, $0 < \varphi < 180°$, $0 < z < 5$.	**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/m² 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 $-3\times10^8\ \varepsilon_0\ x\ C/m^3$.	**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 $\mathbf{H} = 6xy\mathbf{a_x} – 3y^2\ \mathbf{a_y}$ and the rectangular path around the region $2 \leq x \leq 5$, $-1 \leq y \leq 1$ and $z = 0$. Let the positive direction of $\mathbf{ds}$ be $\mathbf{a_z}$.	**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**