11/06/2025 TE ELECTRICAL SEM-V C -SCHEME EMFW QP CODE: 10082680

Time: 3 Hours **Max. Marks: 80**

Note :

- **Question No.1 is compulsory.**
- Solve **ANY THREE** questions from the **remaining** five questions.
- Figure to the right indicates full marks.
- Assume suitable data wherever required, but justify the same.

			Marks
Q. 1		Solve **ANY FOUR** questions from following. (Each question carries 5 marks)	
	a)	"The line integral of the magnetic field around some closed loop is equal to the sum of the currents which pass through the loop". Justify the statement.	**(05)**
	b)	Explain Lorentz's force equation for moving charge. Enlist it's application	**(05)**
	c)	Point charge Q=0.2 μC placed at origin,find electric field instensity at (0,6,8)m.	**(05)**
	d)	Define scalar and vector quantity with example. Also state coulomb's law.	**(05)**
	e)	State and derive the polarization of a dielectric materials.	**(05)**
Q. 2	**a)**	Define Biot-Savart's Law & use it to derive expression for magnetic field intensity due to infinite wire carrying current I.	**(10)**
Q. 2	**b)**	Show that the $\bar{E}$ due to infinte sheet of charge at a point is independent of the distance of that point form the plane containing the charge.	**(10)**
Q. 3	**a)**	An infinite long current filament is placed along z-axis. The magnetic field intensity at point P(6,8,0) is $10(-1.6\overline{a_x} + 1.2\overline{a_y})\ A/m$. Find current through the filament.	**(10)**
Q. 3	**b)**	Derive Maxwell's second equation in both integral and point form.	**(10)**
Q. 4	**a)**	Formulate electromagnetic wave equation from Maxwell's equation for dielectric medium.	**(10)**
Q. 4	**b)**	Find $\overline{D}, \overline{B}\ and\ \overline{H}$ displacement current density in free space, given $\bar{E} = E_m \sin(\omega t - \beta z)\overline{a_y}$.	**(10)**
Q. 5	**a)**	Prove that $E = -\nabla.V$. Also derive the Poission's and Laplace equation .	**(10)**
Q. 5	**b)**	In Cartesian co-ordinate a potential is a function of x only. At $x = -2\ cm, V = 25\ V\ and\ \bar{E} = -1.5 \times 10^3 \overline{a_x}\ V/m$ throughout the region. Find V at x=5 cm.	**(10)**
Q. 6	**a)**	Draw rectangular, cylindrical and spherical co-ordinate system and explain differential element dl, differential surface ds and differential volume dv for all coordinate system	**(10)**
Q. 6	**b)**	A Charge $Q_1 = -20\mu C$ is placed at P(-6,4,6) m and a charge $Q_2 = 50\mu C$ is placed at R(5,8,-2) m in free space. Calculate the exerted force on $Q_2 by\ Q_1$ in vector form.	**(10)**