

04

OLD

(OLD COURSE) Q.P. Code : 3728

(3 Hours)

[Total Marks : 100

- N.B.:** (1) Question No.1 is **compulsory**.
 (2) **Attempt** any **four** questions out of remaining **six** questions.
 (3) Assume any suitable data if **necessary**.
 (4) **Figures** to the **right** indicate **full** marks.

1. Attempt any four of the following :- 20
 - (a) State and explain Divergence theorem.
 - (b) Prove that the curl of gradient of a scalar function is zero.
 - (c) Show that the electrostatic energy stored in parallel plate capacitor is given by $(1/2) \cdot CV^2$
 - (d) Prove that static electric field is irrotational and the static magnetic field is solenoid.
 - (e) State and explain amperes circuital law.

2. (a) If $\vec{E} = -8xy \vec{a}_x - 4x^2 \vec{a}_y + \vec{a}_z$ v/m. Find the work done in carrying a 6 coulombs 10
 charge from A (1, 8, 5) to B (2, 18, 6) along the path $y = 3x + 2, z = x + 4$.
 (b) A uniform line charge, $P_L = 25$ nc/m lies on the line $X = -3, Z = 4$ in free space. 10
 Find \vec{E} in Cartesian components at the point P (2, 15, 3)

3. (a) Derive an expression for the Electric Field Intensity due to an infinite sheet charge. 10
 (b) Given that $D = [(10x^3) / (3)] \cdot \vec{a}_x$ c/m², evaluate both sides of the divergence 10
 theorem for volume of cube, 2m on an edge, centered at the origin and with edges
 parallel to the axes.

4. (a) Find the capacitance of a co-axial conductor of length I, where inner and outer radii 10
 are r_1 of r_2 respectively.
 (b) $V = 0$ volts for $r = 0.1$ m and $v = 100$ volts for $r = 2.0$ m in spherical co-ordinates, 10
 Assuming free space between the concentric spherical shells, find \vec{E} & D using
 Laplace's equation.

5. (a) Using Biot-Savart law, find the magnetic field intensity due to an finite long straight 10
 filament placed along z- axis.
 (b) State and explain Maxwell equation for time-varying fields. 10

6. (a) The circular loop conduction lies in the $z = 0$ plane, has a radius of 0.1m and resistance of 5.0Ω . Given $B = 0.20 \sin 10^3 t \bar{a}_z$ (T), determine the current in the loop. 10
- (b) A square filamentary loop 2 meters in side is placed in $Z = 0$ plane with its center at origin. If current of 10 A is passing through loop, Find H at origin. 10
7. (a) Define Poynting vector. Obtain the integral form of the Poynting theorem and explain each of the terms. 10
- (b) A lossy dielectric has $\mu_r = 1$, $\epsilon_r = 1$ and $\sigma = 20$ mho/s at 15.9 MHz, electromagnetic wave propagating through this medium. Find attenuation constant α , phase constant β , velocity of propagation and intrinsic impedance of the medium. 10
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