

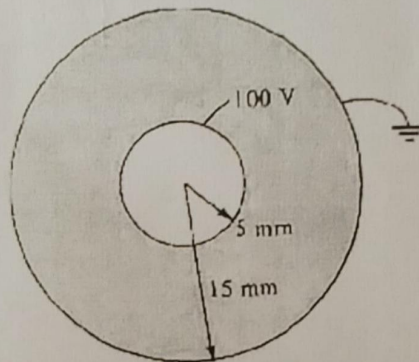


- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

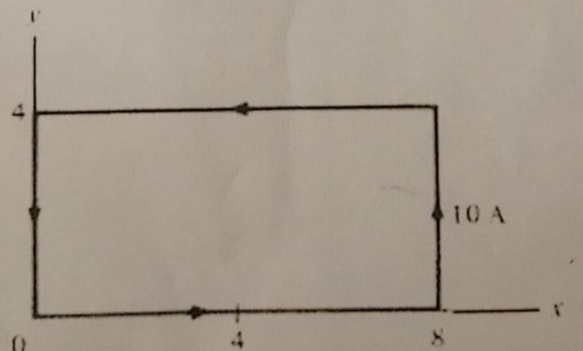
 Answer ALL Questions

(10 X 10 = 100 Marks)

1. Let $A = a_x - a_z$, $B = a_x + a_y + a_z$, $C = a_y + 2a_z$ find:
 - a) $A \cdot (B \times C)$
 - b) $(A \times B) \cdot C$
 - c) $AX(BXC)$
 - d) $(AXB) \times C$
2. The rectangular coordinates at point P are $(x = 2, y = 6, z = -4)$. (a) What are its cylindrical coordinates? (b) What are its spherical coordinates?
3. The spherical shell extending from $r = 2$ cm to $r = 4$ cm has a uniform charge density $\rho_v = 5$ mC/m³. Determine the total charge in the shell.
4. The cylindrical capacitor whose cross section is in Figure below has inner and outer radii of 5 mm and 15 mm, respectively. If $V(\rho = 5 \text{ mm}) = 100$ V and $V(\rho = 15 \text{ mm}) = 0$ V, calculate V , E , and D at $\rho = 10$ mm and ρ_s on each plate. Take, $\epsilon_r = 2.0$.



5. A rectangular loop carrying 10 A of current is placed on $z = 0$ plane as shown in Figure below. Evaluate H at
 - a) $(2, 2, 0)$
 - b) $(4, 2, 0)$



6. Region 1 ($x < 0$) is free space, while region 2 ($x > 0$) is a magnetic material with $\mu = 5\mu_0$. If $B_1 = 4\hat{a}_x - 3\hat{a}_y + \hat{a}_z$ mWb/m², find H_2 .
7. A 50 V voltage generator at 20 MHz is connected to the plates of an air dielectric parallel plate capacitor with a plate area of 2.8 cm² and a separation distance of 0.2 mm. Find the maximum value of displacement current density and displacement current.
8. Explain different type of emf due to electromagnetic induction and obtain emf for different combinations of magnetic field and conductor.
- 9.a) A plane wave propagating through a medium with $\epsilon_r = 8$ $\mu_r = 2$ has $\vec{E} = 0.5e^{-\frac{z}{3}}\sin(10^8t - \beta z)\hat{a}_x$ V/m. Determine the wave impedance and β .

OR

- 9.b) What is displacement current? Through appropriate derivation prove displacement current is equal to conduction current in case of charging capacitor.
 - 10.a) Propose appropriate control techniques for intersystem EMI.
- OR**
- 10.b) Explain the process of wireless power transfer using an appropriate example. Discuss the advantages and disadvantages of it.

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