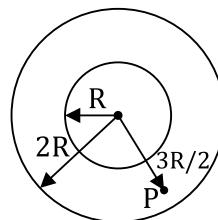




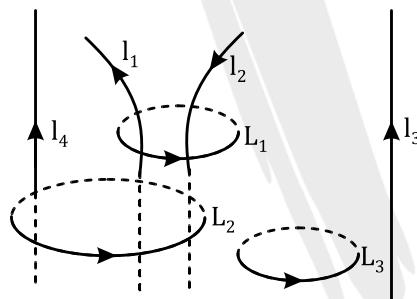
DPP - 06

- Q.1** Figure shows the cross sectional view of a hollow cylindrical conductor with inner radius R and outer radius $2R$ carrying a uniformly distributed current I along its axis.

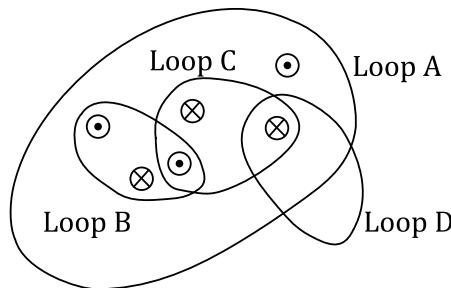


The magnetic induction at point P at a distance $\frac{3R}{2}$ from the axis of the cylinder is $\frac{k\mu_0 I}{(k+1)^2 \pi R}$ then k is ____.

- Q.2** The current density as a function of distance r from the axis of a radially symmetrical parallel stream of electrons is $\frac{b(\alpha+\beta)}{\mu_0} (r)^{(\alpha-\beta)}$. if the magnetic induction inside the stream varies as $B = br^\alpha$, where b and α are positive constants. Then $\beta = \dots$
- Q.3** A solenoid of length 0.4 m and diameter 0.6 m consists of a single layer of 1000 turns of fine wire carrying a current of 5.0×10^{-3} ampere. Find the magnetic field on the axis at the middle and at the ends of the solenoid. (Gives $\mu_0 = 4\pi \times 10^{-7} \frac{V-s}{A-m}$)
- Q.4** Find the value of $\oint \vec{B} \cdot d\vec{l}$ for the loops L_1, L_2, L_3 in the figure shown. The sense of $d\vec{l}$ is mentioned in the figure.



- Q.5** Consider six wires coming into or out of the page as shown in figure, all with the same current, Rank the line integral of the magnetic field from most positive to most negative taken counter clockwise around each loop shown in Figure.





- (A) $B > C > D > A$
 (B) $B > C = D > A$
 (C) $B > A > C = D$
 (D) $C > B = D > A$

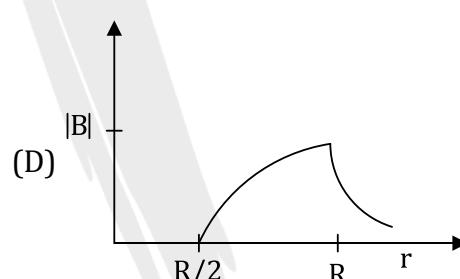
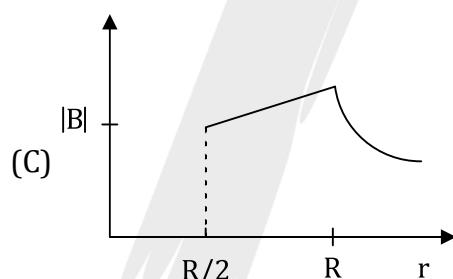
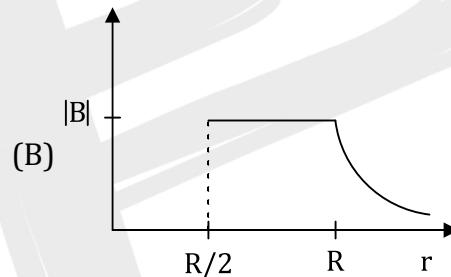
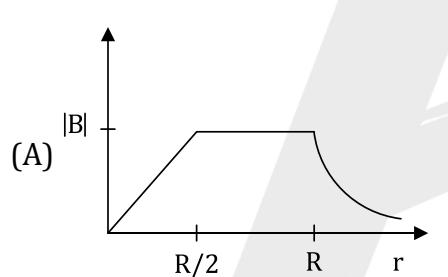
Q.6 The magnetic field near a large metal sheet that carries an electric current of current per unit length λ , along its surface is

- (A) $\frac{\mu_0 \lambda}{2\pi}$
 (B) $\frac{\mu_0 \lambda}{2}$
 (C) $\mu_0 \lambda$
 (D) $\frac{\mu_0}{2\lambda\pi}$

Q.7 A coaxial cable consists of a thin inner conductor fixed along the axis of a hollow outer conductor. The two conductors carry equal currents in the same directions. Let B_1 be the magnetic field at a point between the two conductors, at a distance x from the axis. Let B_2 be the magnetic field at a point outside the outer conductor, at a distance $2x$ from the axis

- (A) $B_1 = 2B_2$
 (B) $B_2 = 2B_1$
 (C) $B_2 = B_1$
 (D) $B_2 = 4B_1$

Q.8 An infinitely long hollow conducting cylinder with inner radius $\frac{R}{2}$ and outer radius R carries a uniform current density along its length. The magnitude of the magnetic field, $|\vec{B}|$ as a function of the radial distance r from the axis is best represented by





Answer key

1. 5 2. 1
3. (i) $\frac{\pi \times 10^{-5}}{\sqrt{13}} \text{ T}$ (ii) $B = 2\pi \times 10^{-6} \text{ Wb/m}^2$
4. (i) $\mu_0(I_1 - I_2)$ (ii) $\mu_0(I_1 - I_2 + I_4)$ (iii) 0
5. (C) 6. (B) 7. (C) 8. (D)

