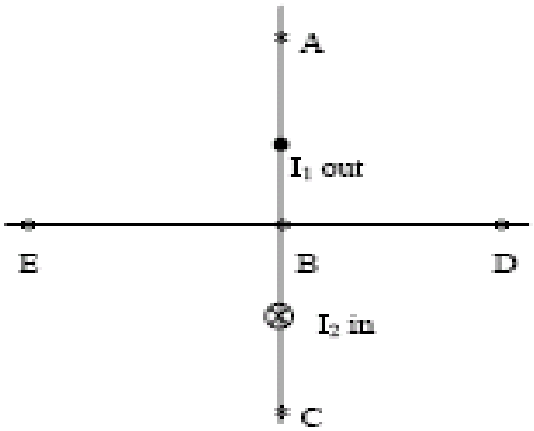
Old Exam Questions Chapter 29

T071

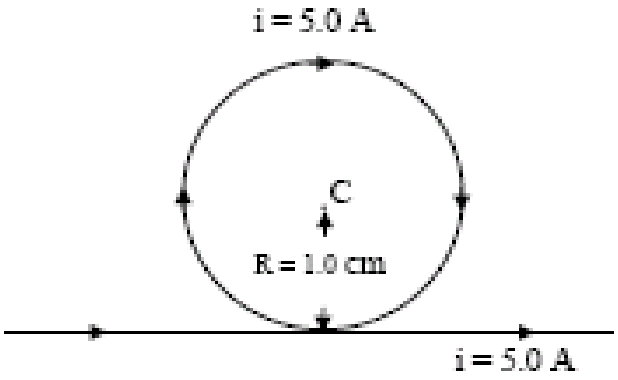
Q23. Two long straight, parallel wires are 3.0 cm apart. They carry currents I1 = 3.0 A and I2= 5.0 A in opposite directions, as shown in the figure 1. At what point, beside infinity, could the magnetic field be zero? (Ans: A)



Q24. A cylindrical wire of radius R carries current I uniformly distributed across its crosssection.
Find the magnetic field inside the wire at r < R from the axis. (Ans: $B=\mu_0 i\, r/(2\pi R^2)$)

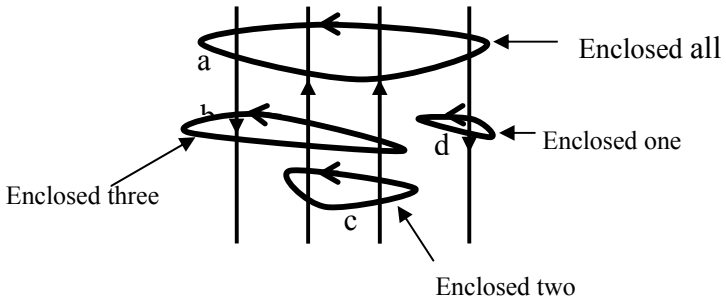
Q25. A magnetic field of 0.10 T is generated near the center of a 10 cm long solenoid. How many turns are needed if the current in the wire is 10 A? (Ans: 796)

Q27. What is the magnetic field at the center of the loop in the figure 2. (Ans: 2.1×10^{-4} T into the page)

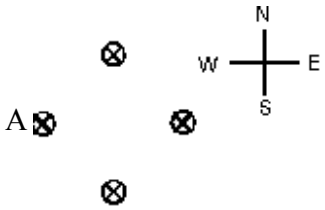


T062

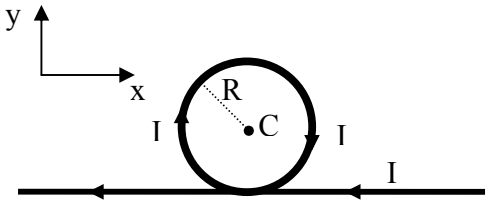
Q24. The figure 1 shows four wires carrying equal currents and four Amperian loops. Rank the loops according to the magnitude of $\oint \vec{B} \cdot \vec{ds}$ along each, greatest first. (Ans: c, b and d tie, then a)



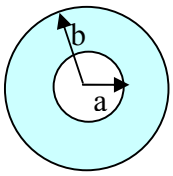
Q25. Four long straight wires carry equal currents into the page as shown in the figure 2 . The direction of the net magnetic force exerted on wire A by the other three wires is: (Ans: East)



Q26. A very long wire carries a current I = 0.5 A directed along the negative x-axis. Part of the wire is bent into a circular section of radius R = 2.5 cm as shown in the figure. What is magnetic field at point C? (Ans: 16.6 μT, into the page)



Q27. An ideal solenoid that is 100 cm long has a diameter of 5.0 cm and a winding of 1000 turns and carries a current of 5.0 A. Calculate the magnetic field inside the solenoid. (Ans: 6.3 mT)



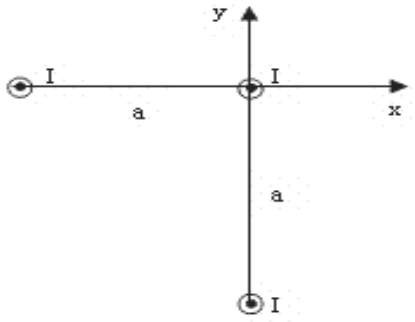
Q28. The following figure shows a hollow cylindrical conductor of inner radius a = 3.0 mm and outer radius b = 5.0 mm carries a current of 2.0 A parallel to its axis. The current is uniformly distributed over the cross section of the conductor. Find the magnitude of the magnetic field at a point that is 2.0 mm from the axis of the conductor. (Ans: Zero)

T061:

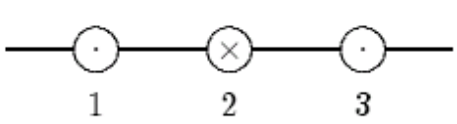
Q#23. Two long straight wires are parallel and carry current in opposite directions. The currents are 8.0 and 12A and the wires are separated by 0.40 cm. The magnetic field in tesla at a point midway between the wires is(Ans: 20×10^{-4})

Q#25. A 600-turn solenoid is 40 cm long, has a radius of 0.6 cm and carries a current of 3.0 A. The magnitude of the magnetic field at the center of the solenoid is (Ans: 5.65 mT).

Q#26. Suppose that the identical currents I in the following figure 1 are all out of the page. The magnitude of the force per unit length on the wire at the origin is: [take I = 10.0 A, and a = 10^{-4} m.] (Ans: 0.28 N/m.)



Q27. The Figure 3 shows three equally spaced wires that are perpendicular to the page. The currents are all equal, two being out of the page and one being into the page. Rank the wires according to the magnitudes of the magnetic forces on them, from least to greatest.(Ans: 2, then 1 and 3 tie)



T052:

Q#8. Two long straight current-carrying parallel wires cross the x-axis and carry currents I and 3I in the same direction, as shown in Figure 4. At what value of x is the net magnetic field zero? (Ans: 1 cm.)

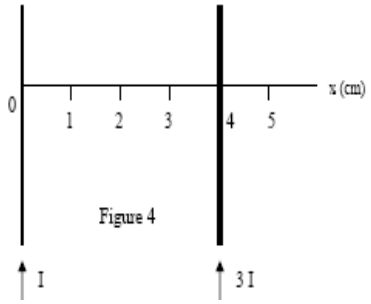


Figure 4

Q#10. Figure 6 shows a long straight wire and a circular loop (R=4 cm), both are carrying the same current I=25 A. Calculate the value of the magnetic field at the center of the loop. (Ans:5.2×10^{-4} T).

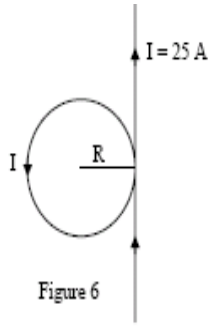


Figure 6

Q#19. A wire lying along the y axis from y = 0 to y = 0.36 m carries a current of 2.0 mA in the negative direction of the y axis. The wire fully lies in a uniform magnetic field given by B=0.36 i + 0.46 j (T). What is the magnetic force on the wire?
(Ans:2.6×10^{-4} N in the positive z direction)

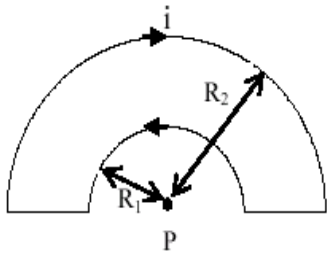
Q#28. A solenoid is 3.0 cm long and has a radius of 0.50 cm. It is wrapped with 500 turns of wire carrying a current of 2.0A. The magnetic field at the center of the solenoid is: (Ans: 4.2×10^{-2} T)

T-051:

Q#2. A long solenoid has 10 turns per cm and carries a 4 A current. A circular loop with cross-sectional area = 8 cm 2 has 5 turns and lies within the solenoid with its axis parallel to the axis of the solenoid. Find the magnitude of the induced emf if the current increases 0 to 4 A in 0.1 s. (A: 4.0×10^{-4} V).

Q#3. A 500 turns toroid has a radius of 5 cm. If the magnetic field inside the toroid is 0.04 T, the current passing through the toroid is (A: 20 A).

Q#16. In the figure 2 shown, R2 = 3×R1 = 9 cm. The current i = 10A. Calculate the magnitude magnetic field at point p.(A: 7.0×10^{-5} Tesla.)



Q#30. The figure 3 shows three parallel wires carrying currents I1 = 2 A, I2 = 6 A, and I3. The spacing between adjacent wires is 1 cm. Calculate the value of I3 such that the magnitude of the net force per unit length at the third wire is 0.25×10^{-3} N/m.(A: 2.5 A).