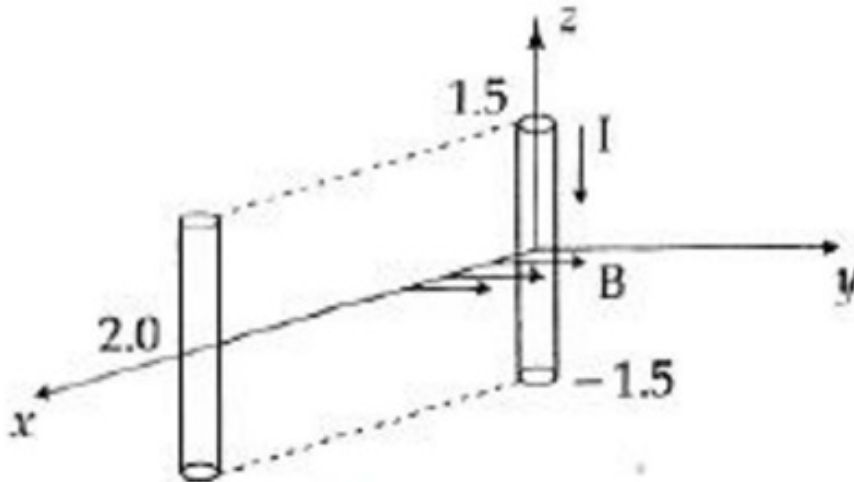


1. A conductor lies along the z-axis at $-1.5 \leq z < 1.5\text{m}$ and carries a fixed current of 10A in $-a_x$ direction. For a field $B = 3 \times 10^{-4} e^{-0.2x} a_y$ Tesla, find the power required to move the conductor at constant speed to $x = 2\text{m}$, $y=0\text{m}$ in $5 \times 10^{-3}\text{sec}$. assume parallel motion along the x-axis



- (a) 1.57 W
(b) 2.97 W
(c) 14.85 W
(d) 29.7 W

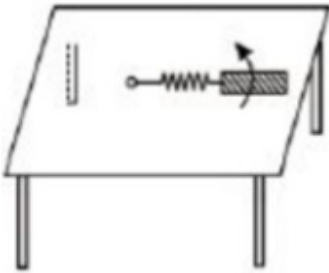
correct option – (b)

2. A circular loop of radius 0.3 cm lies parallel to a much bigger circular loop of radius 20 cm. The centre of the smaller loop is on the axis of the bigger loop. The distance between their centres is 15 cm. If a current of 2.0 A flows through the bigger loop, then the flux linked with smaller loop is

- (a) 9.1×10^{-11} Wb
(b) 6×10^{-11} Wb
(c) 3.3×10^{-11} Wb
(d) 6.6×10^{-9} Wb

correct option – (a)

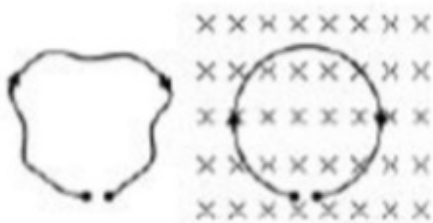
3. A metallic rod of length ' l ' is tied to a string of length ' $2l$ ' and made to rotate with angular speed ω on a horizontal table with one of the string fixed. If there is a vertical magnetic field B in the region, the emf induced across the ends of the rod is



- (a) $\frac{2B\omega l^3}{2}$
 (b) $\frac{3B\omega l^3}{2}$
 (c) $\frac{4B\omega l^2}{2}$
 (d) $\frac{5B\omega l^2}{2}$

correct option – (d)

4. A thin flexible wire of length L is connected to two adjacent fixed points and carries a current I in the clockwise direction, as shown in the figure. When the system is put in a uniform magnetic field of strength B going into the plane of the paper, the wire takes the shape of a circle. The tension in the wire is



- (a) IBL
 (b) $\frac{IBL}{\pi}$
 (c) $\frac{IBL}{2\pi}$
 (d) $\frac{IBL}{4\pi}$

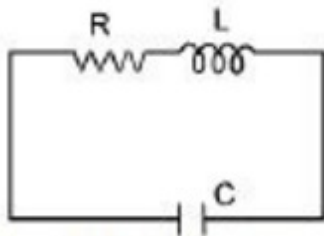
correct option – (C)

5. A current carrying infinitely long wire is kept along the diameter of a circular wire loop, without touching it. The correct statement (s) is / (are)

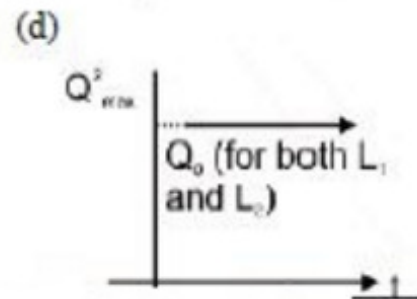
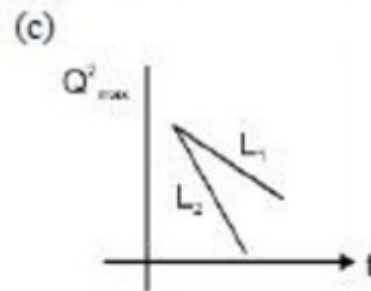
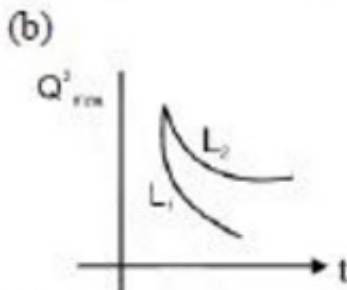
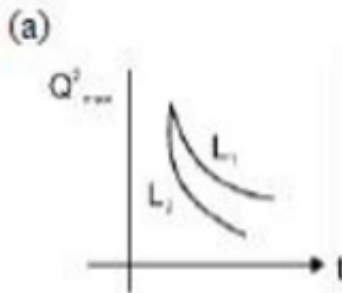
- (a) The emf induced in the loop is zero if the current is constant
- (b) The emf induced in the loop is finite if the current is constant
- (c) The emf induced in the loop is zero if the current decreases at a steady rate
- (d) The emf induced in the loop is finite if the current decreases at a steady rate

Correct option (d)

6. An LCR circuit is equivalent to a damped pendulum. In an LCR circuit the capacitor is charged to Q_0 and then connected to the L and R as shown below:



If a student plots graphs of the square of maximum charge (Q^2_{Max}) on the capacitor with time (t) for two different values L_1 and L_2 ($L_1 > L_2$) of L then which of the following represents this graph correctly? (plots are schematic and not drawn to scale)



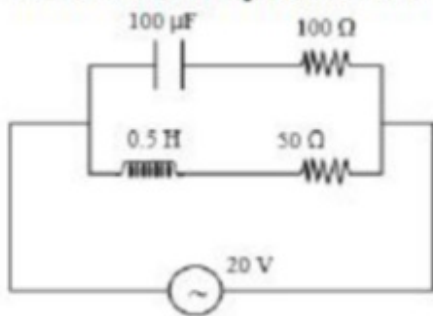
Correct option- (a)

7. The amplitude of a damped oscillator decreases to 0.9 times its original magnitude in 5s. In another 10s it will decrease to α times its original magnitude, where α equals

- (a) 0.7
- (b) 0.81
- (c) 0.729
- (d) 0.6

correct option-(c)

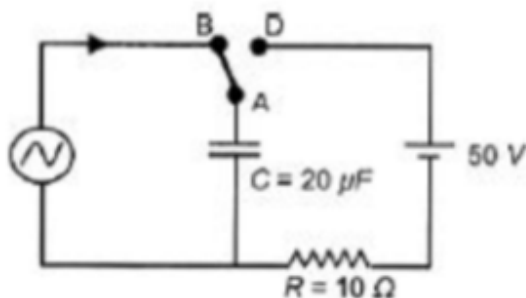
8. Q4. In the given circuit, the AC source has $\omega = 100$ rad/s. Considering the inductor and capacitor to be ideal, the correct choice(s) is (are)



- (a) The current through the circuit, I is 0.3 A.
- (b) The current through the circuit, I is $0.3\sqrt{2}$ A
- (c) The voltage across 100Ω resistor is $10\sqrt{2}$ V
- (d) The voltage across 50Ω resistor is 10 V.

correct option- (a) & (c)

9. Q3. At time $t = 0$, terminal A in the circuit shown in the figure is connected to B by a key and an alternating current $I_t = I_0 \cos(\omega t)$, with $I_0 = 1$ A and $\omega = 500$ rad s^{-1} starts flowing in it with the initial direction shown in the figure. At $t = \frac{7\pi}{6\omega}$, the key is switched from B to D. Now onwards only A and D are connected. A total charge Q flows from the battery to charge the capacitor fully. If $C = 20 \mu F$, $R = 10 \Omega$ and the battery is ideal with emf of 50V, identify the correct statement (s).



(a) Magnitude of the maximum charge on the capacitor before $t = \frac{7\pi}{6\omega}$ is $1 \times 10^{-3} \text{ C}$.

(b) The current in the left part of the circuit just before $t = \frac{7\pi}{6\omega}$ is clockwise.

(c) Immediately after A is connected to D, the current in R is 10A.

(d) $Q = 2 \times 10^{-3} \text{ C}$

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orrect option- (c) & (d)

10. 3) The figure shows variation of R, XL and XC with frequency f in a series L, C, R circuit. Then for what frequency point,



A) A

B) B

C) C

D) All points

Correct option- (c)