IIT PHYSICS CENTRE

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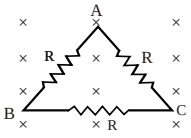
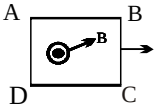
1. Three resistance of magnitude R each are connected in the form of an equilateral triangle of side a. The combination is placed in a magnetic field $B = B_0 e^{-at}$ perpendicular to the plane. The induced current in the circuit is given by :



(A) $\left(\frac{a^2 a}{2\sqrt{3}R} B_0\right) e^{-at}$ **(B)** $\left(\frac{a^2 a}{4\sqrt{3}R} B_0\right) e^{-at}$

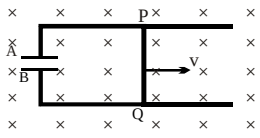
(C) $\left(\frac{a^2 B_0}{4a\sqrt{3}R}\right) e^{-at}$ **(D)** $\left(\frac{a^2 B_0 R}{4a\sqrt{3}}\right) e^{-at}$

2. A metallic square loop ABCD is moving in its own plane with velocity v in a uniform magnetic field perpendicular to its plane as shown in the figure. An electric field is induced



(A) In AD, but not in BC **(B)** In BC, but not in AD
(C) Neither in AD nor in BC **(D)** In both AD and BC

3. A conducting rod PQ of length L = 1.0 m is moving with a uniform speed v = 2 m/s in a uniform megnetic field B = 4.0 T directed into the paper. A capacitor of capacity C = 10 «F is connected as shown in figure. Then

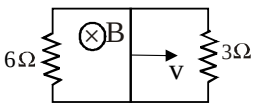


(A) $q_A = +80 «C$ and $q_B = -80 «C$

(B) $q_A = -80 «C$ and $q_B = +80 «C$ **(C)** $q_A = 0 = q_B$

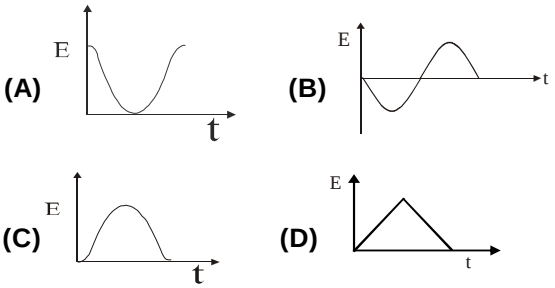
(D) Charge stored in the capacitor increases exponentially with time

4. A rectangular loop with a sliding connector of length l = 1.0 m is situated in a uniform magnetic field B = 2T perpendicular to the plane of loop. Resistance of connector is r = 2Ω . Two resistors of $6\,W$ and $3\,W$ are connected as shown in the figure. The external force required to keep the connector moving with a constant velocity v = 2 m/s is

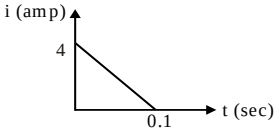


(A) 6 N **(B)** 4 N **(C)** 2 N **(D)** 1 N

5. The variation of induced emf (E) with time (t) in a coil if a short bar magnet is moved along its axis with a constant velocity is best represented as

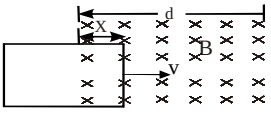


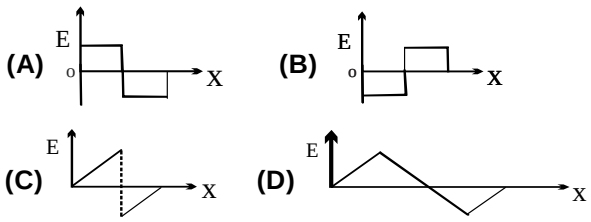
6. Some magnetic flux is changed from a coil of resistance 10 ohm. As a result an induced current is developed in it, which varies with time as shown in figure. The magnitude of change in flux through the coil in weber is



(A) 2 **(B)** 4 **(C)** 6 **(D)** None.

7. A rectangular loop is being pulled at a constant speed v, through a region of certain thickness d, in which uniform magnetic field B is set up. The graph between position x of the right hand edge of the loop and the induced emf E will be





8. A magnet is made to oscillate with a particular frequency, passing through a coil as shown in figure. The time variation of the magnitude of e.m.f generated across the coil during one cycle is