Q.No. **PHYSICS**

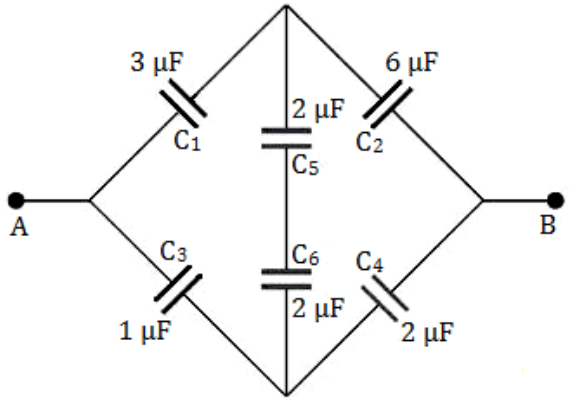
1. A mass m rotates in a vertical circle of radius R and has a circular speed v_c at the top. If the radius of the circle is increased by a factor of 4, circular speed at the top will be

   A) decreased by a factor of 2 B) decreased by a factor of 4 C) increased by a factor of 2 D) increased by a factor of 4

2. A vessel contains 1 mol of O_2 and 2 mol of He. What is the value of $'C_P/C_V'$ of the mixture?

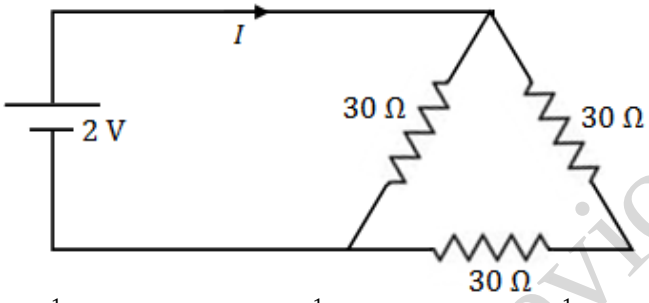
   A) $17/11$ B) $71/65$ C) $38/15$ D) $46/15$

3. The effective capacitance between terminals A and B (as shown in the figure) is



   A) 16 μF B) 8 μF C) 6 μF D) 8/3 μF

4. The current I in the circuit shown below is



   A) $\frac{1}{45}$ A B) $\frac{1}{15}$ A C) $\frac{1}{10}$ A D) $\frac{1}{5}$ A

5. An electric wire in the wall of a building carries a DC current of 25 A vertically upward. What is the magnetic field due to this current at a point which is 10 cm to the right of the wire?

   A) 3.1×10^{-4} T B) 5.0×10^{-5} T C) 4.23×10^{-4} T D) 5.11×10^{-3} T

6. In an electric circuit, R, C, L and AC voltage are all connected in series. When L is removed from the LCR circuit, the phase difference between the voltage and the current in the circuit is $\pi/3$. If instead, C is removed from the LCR circuit, the phase difference is again $\pi/3$. Determine the power factor of the circuit.

   A) $\frac{1}{2}$ B) $\frac{1}{\sqrt{2}}$ C) 1 D) $\frac{\sqrt{3}}{2}$

7. A short object of length l is placed along the principal axis of a concave mirror away from focus. The object distance is x. If the mirror has a focal length f what will be the length of the image? ($l << |v - f|$, where v is the image distance)

   A) $\frac{(x-f)^2}{f^2 l}$ B) $\frac{f^2 l}{(x-f)^2}$ C) $\frac{fl}{(x-f)}$ D) $\frac{(x-f)}{fl}$

8. The wavelength of the characteristic X-ray K_α line emitted by a hydrogen like element is 0.32 Å. The wavelength of K_β line emitted by the same element will be

   A) 0.21 Å B) 0.27 Å C) 0.34 Å D) 0.40 Å

9. The number of alpha-particles scattered at 60^o is 100 per minute in an alpha-scattering experiment on gold foil. The number of alpha-particles scattered per minute at 90^o will be

   A) 25 B) 50 C) 16 D) 32

10. A p-n junction diode connected in series with a resistor of 200 Ω is forward biased so that a current of 200 mA flows. If the voltage across this combination is instantaneously reversed at t = 0, the current through diode is approximately,

    A) 400 mA B) 200 mA C) 100 mA D) 0 mA