

Physics for IIT-JEE by Shiv R. Goel (B.Tech., IIT-Delhi)

DPP#24 30/06/2018

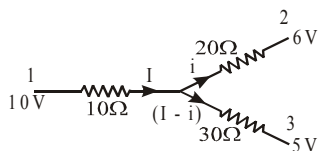
CLASS-XII

Topic: Current Electricity

SOLUTION

1. (2)

Sol.



From 1 - 0 - 2

$$10V - I(10) - i(20) = 6$$

$$4 = 10(I + 2i) \quad \dots (1)$$

from 1 - 0 - 3

$$10V - 10(I) - (I - i)(30) = 5$$

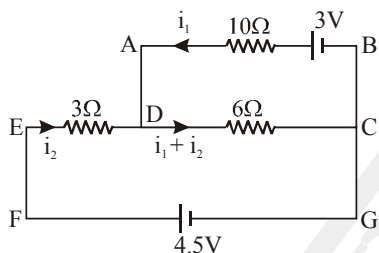
$$10 - 40I + 30i = 5$$

$$5 = 10(4I - 3i) \quad \dots (2)$$

Solving 1 and 2 we get $i = 0.1A$, $I = 0.2$

2. (1)

Sol.



In ABCDA

$$3 - 10i_1 - 6(i_1 + i_2)$$

$$3 = 16i_1 + 6i_2 \quad \dots (1)$$

In DCGFED

$$-3i_2 - (i_1 + i_2)6 + 4.5 = 0$$

$$9i_2 + 6i_1 = 4.5 \quad \dots (2)$$

Solving (1) and (2)

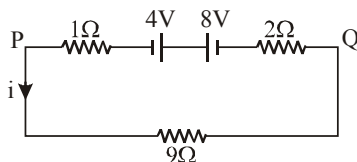
$$i_1 = 0$$

3. (2)

Sol. It depends upon the value of emf of battery.

4. (1)

Sol.



Applying loop law.

$$-9(i) - 2i + 8 - 4 - 1(i) = 0$$

$$4 - 12i = 0$$

$$I = \frac{1}{3} \text{ A}$$

Now from P to Q

$$V_P + 1\left(\frac{1}{3}\right) + 4 - 8 + 2\left(\frac{1}{3}\right) = V_Q$$

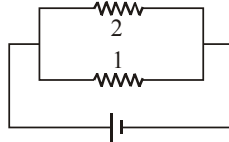
$$V_P - V_Q = 4 - 1 = 3 \text{ V}$$

5. (4)

Sol. As the ratio of resistances in upper branch is same as of in lower branch so P.D. between A and B = 0.

6. (3)

Sol. Now P.D. across both of the resistances is same



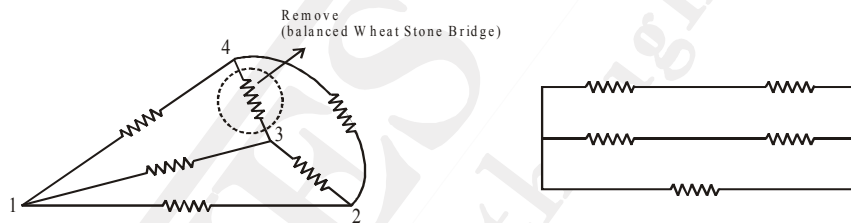
$$P = \frac{V^2}{R}$$

$$P \propto \frac{1}{R}$$

$$\text{So } P_2 : P_1 = 1 : 2$$

7. (1)

Sol. For 1 - 2 effective ckt will be

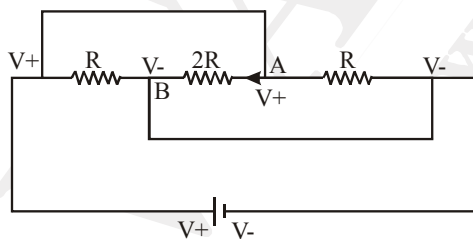


$$\Rightarrow \frac{r}{2}$$

Same for 1 and 3

8. (2)

Sol.



Pontential at A > Pontential at B.

9. (1)

Sol. If reading of A_1 is 2.4A so P.D. across $20\Omega \Rightarrow V = 2.4 \times 20 = 48 \text{ V}$

So P.D. across 30Ω will be also 48V

$$\text{So reading of } A_2 \Rightarrow i = \frac{48}{30} \Rightarrow 1.6 \text{ A}$$

Now current through A_3

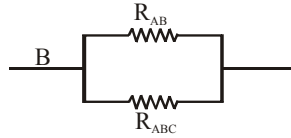
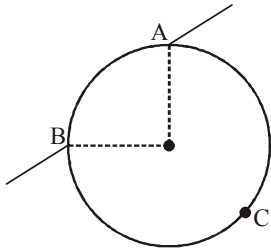
= current through A_1 + current through A_2

$$= 1.6 + 2.4 = 4 \text{ A}$$

10. (3)

11. (3)

Sol. $\ell_{AB} = \frac{\pi R}{2}$



$$\ell_{ABC} = \frac{3\pi R}{2} = \frac{3\pi r}{2}$$

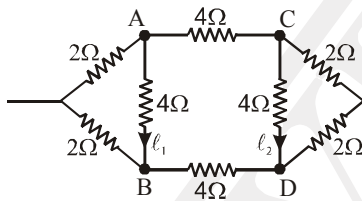
$$R_{ABC} = \left(\frac{3\pi R}{2}\right) r = \frac{3\pi r}{2}$$

$$R_{net} = \frac{(R_{AB})(R_{ABC})}{(R_{AB}) + R_{ABC}}$$

$$\Rightarrow \frac{\left(\frac{\pi r}{2}\right)\left(\frac{3\pi r}{2}\right)}{2\pi r} \Rightarrow \frac{3\pi r}{8}$$

12. (3)

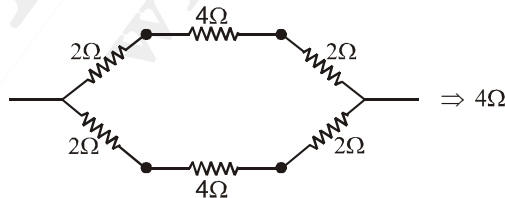
Sol.



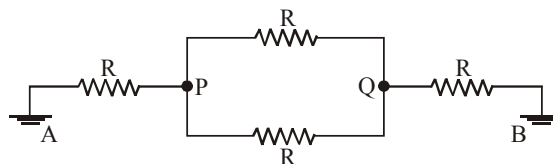
As $V_A = V_B$ and $V_C = V_D$

So $i_1 = i_2 = 0$

Effective ckt will be like.

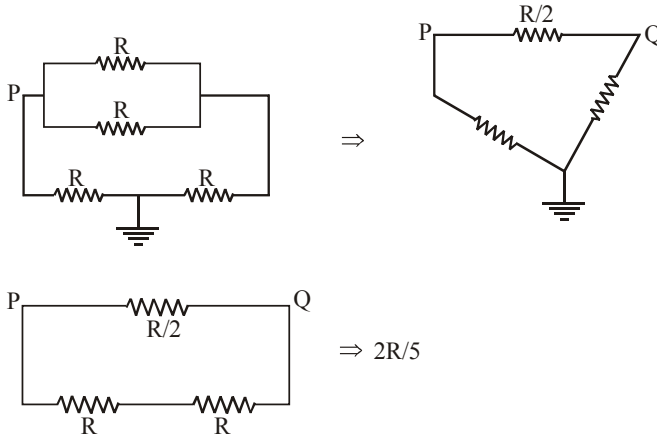


13. (2)



Potential of $A = B = 0$

So ckt can be drawn as



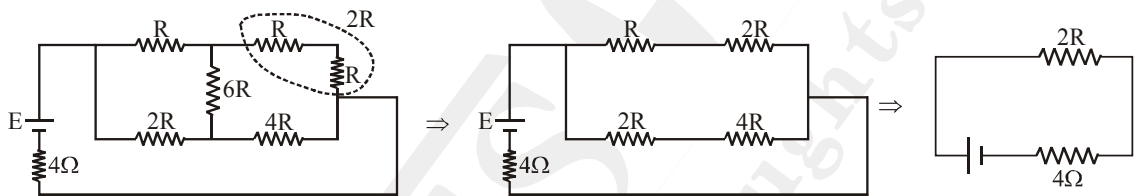
14. (3)

Sol. If is a condition of balanced WS Bridge

$$\text{So } \frac{R_3}{R_4} = \frac{R_1}{R_2} \Rightarrow R_2 R_3 = R_1 R_4$$

15. (2)

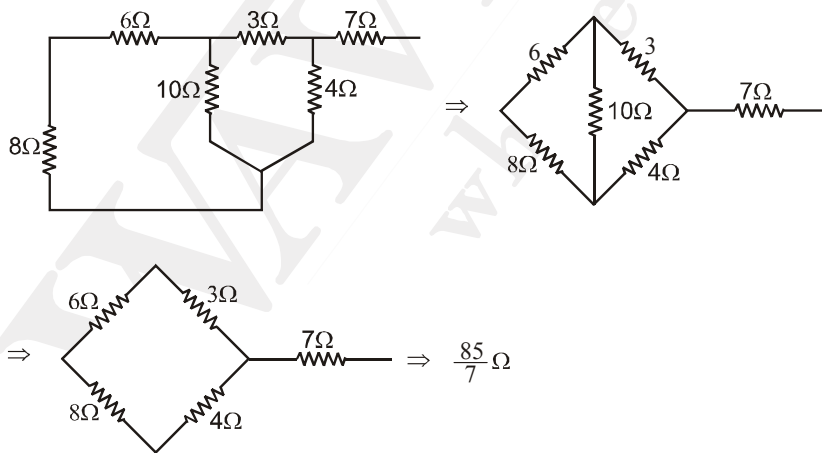
Sol.



For maximum power $r = R \Rightarrow 2R = 4 \Rightarrow R = 2\Omega$ (For Maximum power internal resistance of battery = external resistance)

16. (3)

Sol.



17. (1)

Sol. It is a balanced WS Bridge.