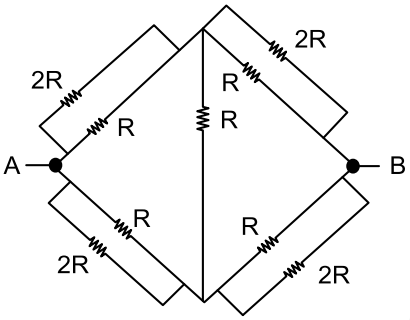
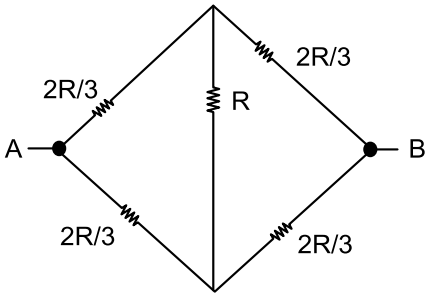
## DPP-5

## SOLUTION

**Link to View Video Solution:** Click Here

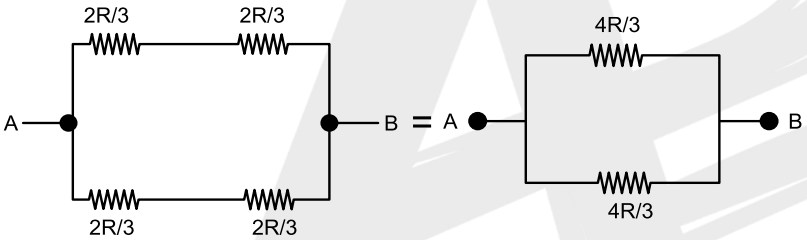
**1.** Requivalent b/w A and B




It is balanced wheat stone bridge

So current is R = 0




$R_{AB} = \frac{4R}{6} = \frac{2R}{3}$

**2.** In circuit

$V_B = V_D$

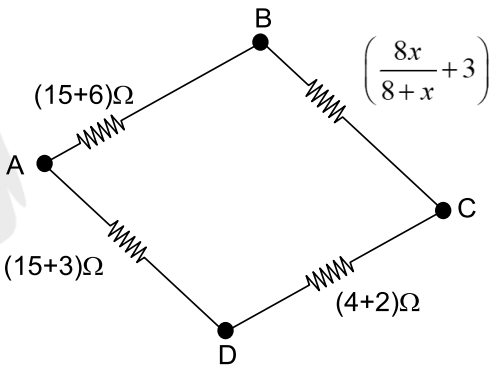
that's mean

$$(15+3)\left(\frac{8x}{8+x}+3\right) = (21\times 6)$$

$$\frac{\cancel{18}}{\cancel{3}}\left(\frac{8x+24+3x}{8+x}\right) = \frac{\cancel{21}^{7}\times\cancel{6}}{} \Rightarrow 11x+24 = 56+7x$$

$$4x = 56-24 \quad \Rightarrow \quad x = \frac{32}{4}$$

$x = 8\Omega$




**3.** Each resistance = $r_0$

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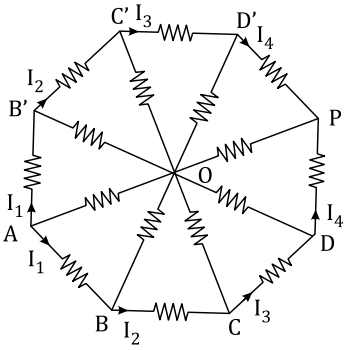
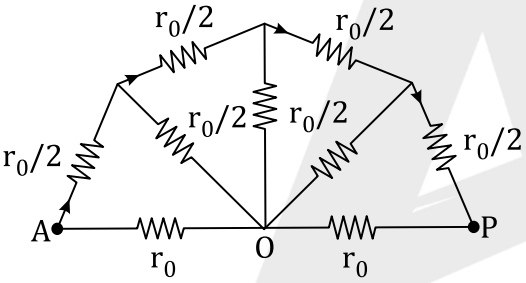



Potential of $B = B'$

$C = C'$

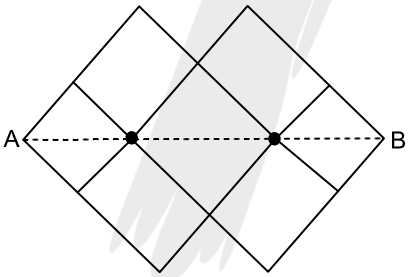
$D = D'$

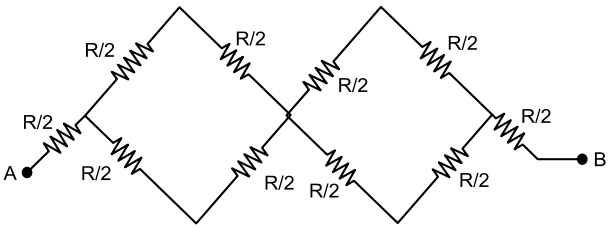
This circuit symmetry about AOP

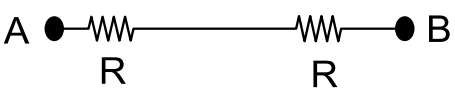



After solving $R_{AO} = \frac{69r_0}{149}$

**4.** Circuit is symmetrical about line AB




$R_{AB} = 2R$

**5.** Method of sawing this question. one of the Solving best approach is node analysis with battery connection

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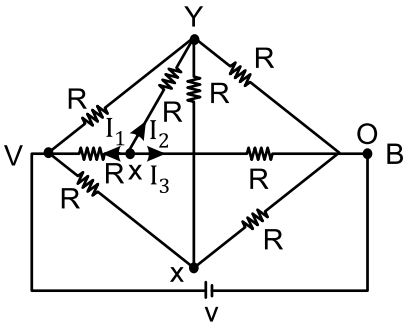



step-: Attach a V-Volt battery and assign potential at each node

By symmetry

$V - Y = Y - 0$

$Y = V/2$

Using KCL is at point $p$

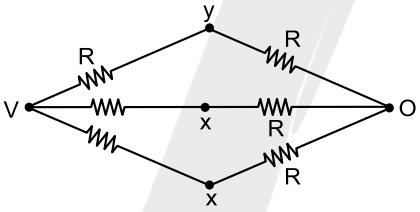
$$\frac{X-V}{R} + \frac{X-Y}{R} + \frac{X-0}{R} = 0$$

$3X = V + Y$

$x = \frac{V}{2}$ $\quad [Y = V/2]$

$\Rightarrow V_x = V_y$

final circuit




$$R_{eq} = \frac{2R}{3}$$

**6.** Equivalent resistance can be obtained by.

$$R_{AB} = \frac{100}{\frac{2x}{R} + \frac{50}{R}}$$

$$\frac{x}{R} + \frac{x-50}{R} + \frac{x(100-x)}{R} = 0$$

$$x = \frac{75}{R}$$

**7.** Points B and C, and E and F are at the same potential, so the circuit can be redrawn as shown in figure. Thus, the equivalent resistance is 1Ω. There exists parallel axis of symmetry. The points across the parallel axis of symmetry can be treated as equipotential points.

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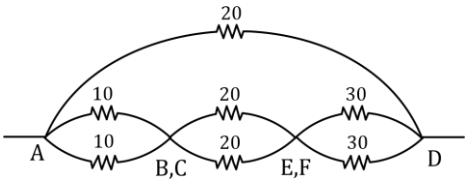
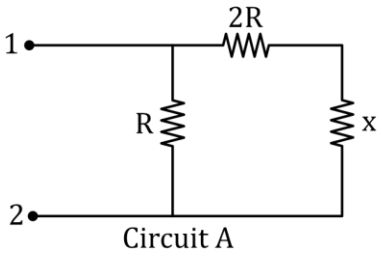
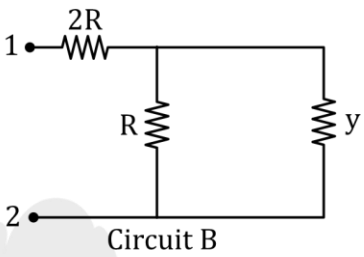



**8.**




$x = \frac{R(2R+x)}{3R+x}$

$\Rightarrow 3Rx + x^2 = 2R^2 + Rx$

$\Rightarrow x^2 + 2Rx - 2R^2 = 0$

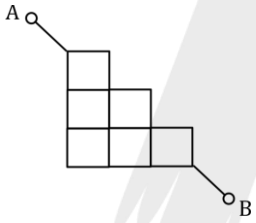
$\Rightarrow x = \frac{-2R \pm \sqrt{4R^2+8R^2}}{2}$

$\Rightarrow x = \frac{-2R+2\sqrt{3}R}{2}$

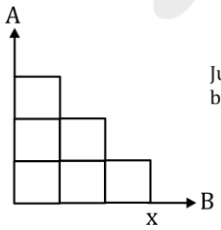
$\Rightarrow x = (\sqrt{3}-1)R$

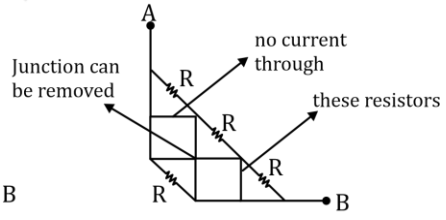
**9.** First fold the circuit about diagonal AB.s

Find $R_{AB}$ given resistance of each branch is R.




Resistance is now $\frac{R}{2}$.




**For folding the potentials of points must be same.

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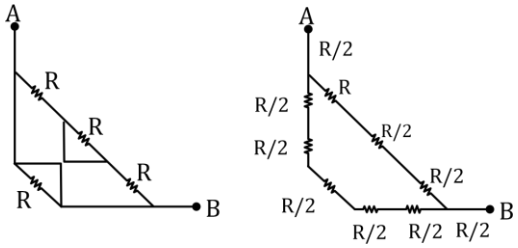


Now equivalent is $\frac{9R}{4}$