LAKSHYA JEE

LAKSHYA KO HAR HAAL ME PAANA HAI

Electric Potential & Capacitance

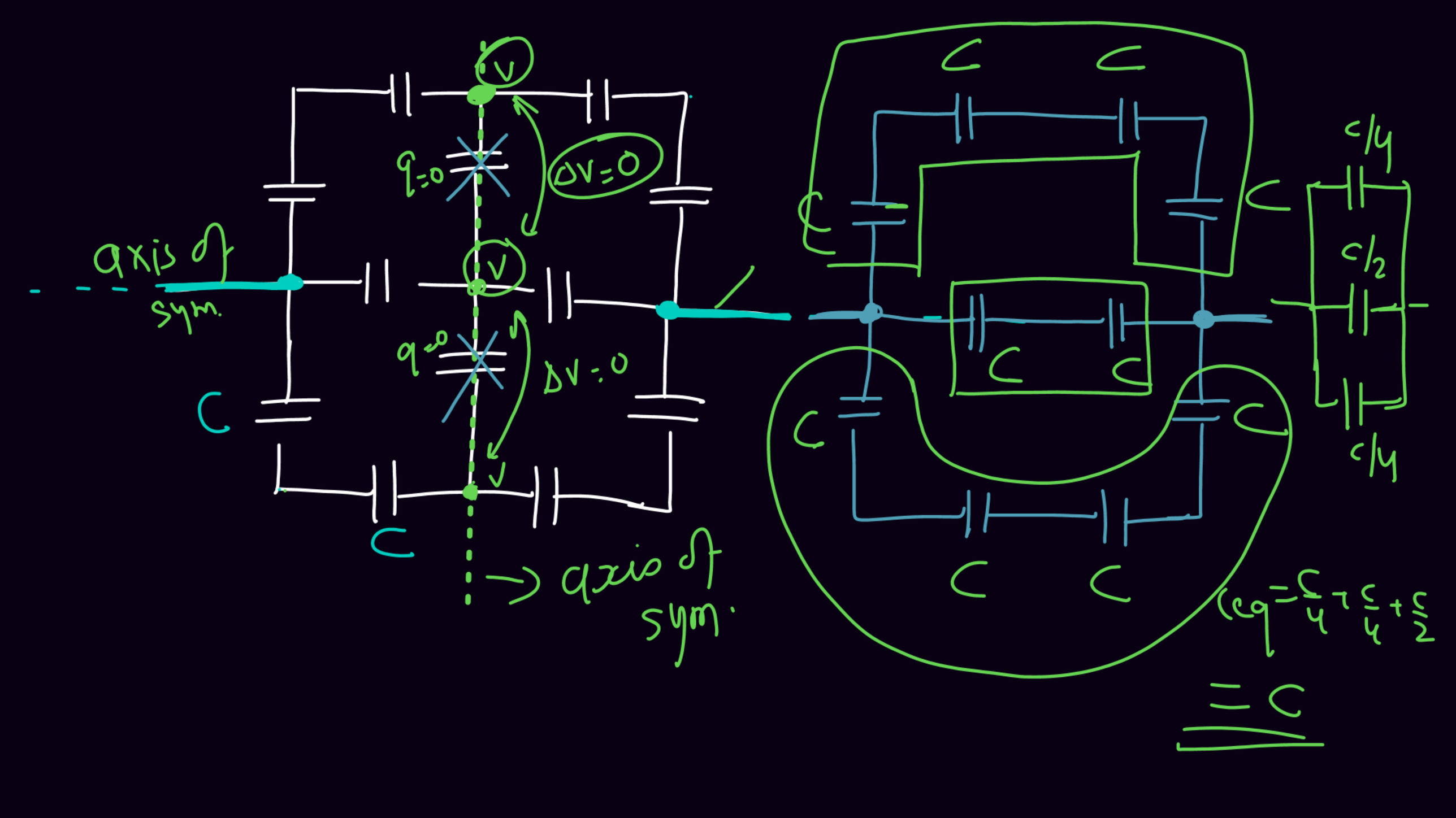
-Er. Rohit Gupta

Today's GOALS!

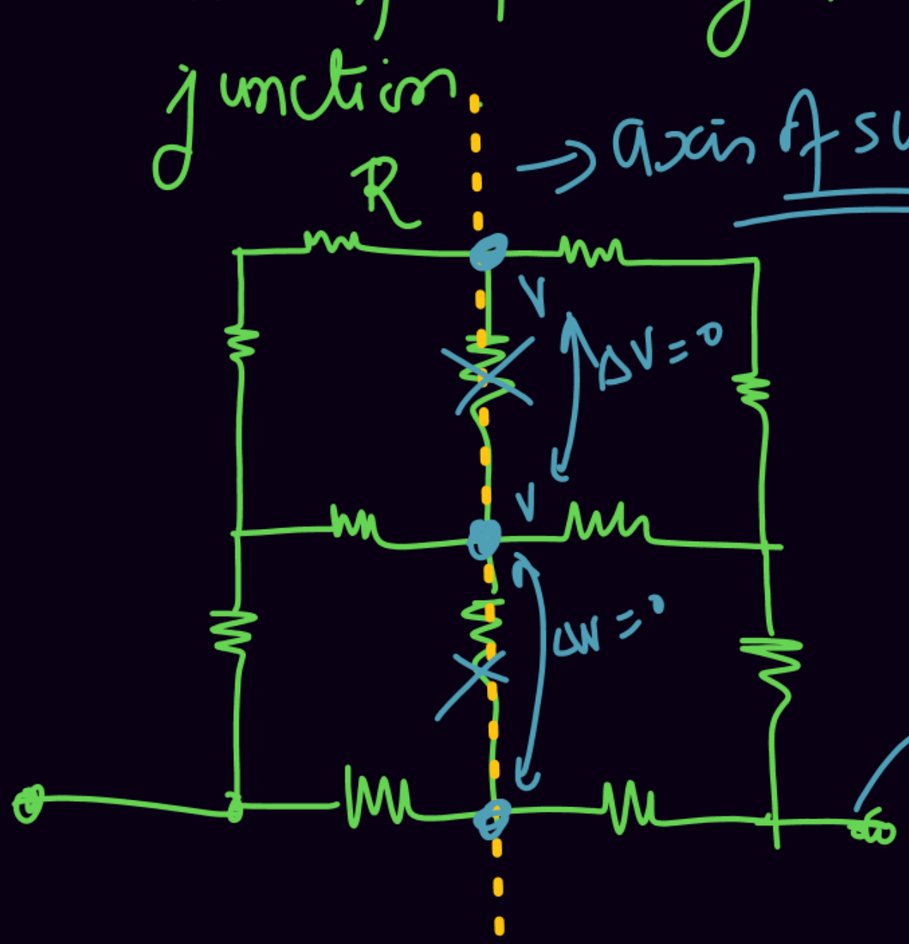
symmetric circuits

Symmetry circuits

1. If the line joining the terminals becomes axis of symmetry then the perpendiculars drawn on it will carry equipotential junctions.


V
q=0
ΔV=0
axis of sym.
V
q=0
ΔV=0
C
V
C
→ axis of sym.
C
C
C
C
C
C
C
C
C
C
C
C/4
C/2
C/4
(Ceq = C/4 + C/4 + C/2
= C

2. If the ⊥ bisector to the line joining the terminals becomes axis of symmetry then this ⊥ bisector will carry equipotential junction.



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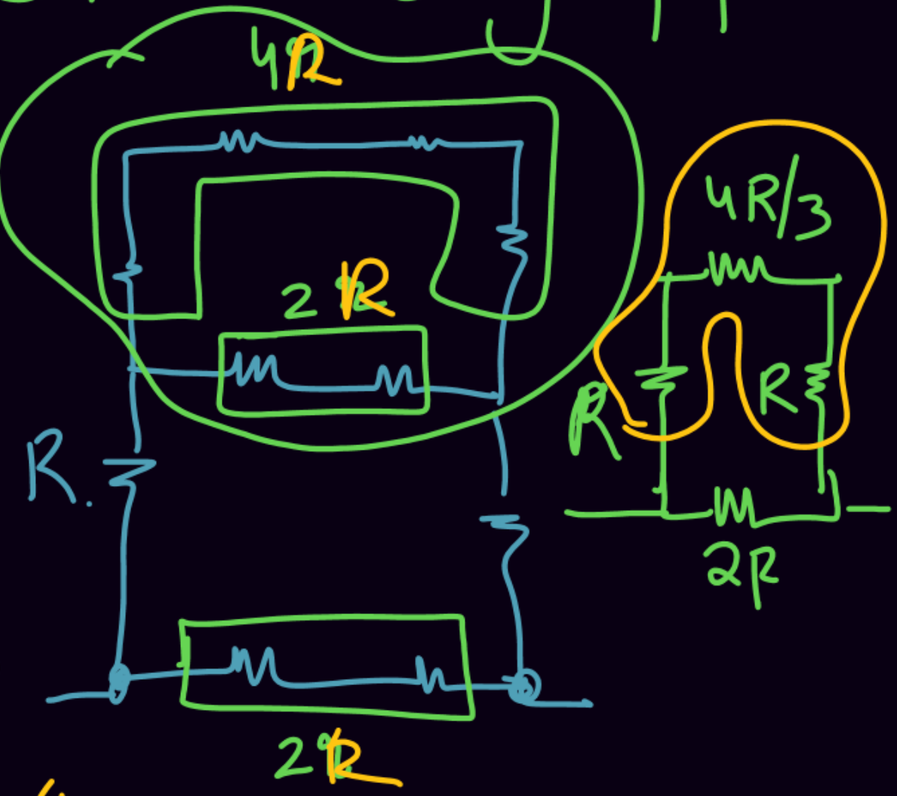


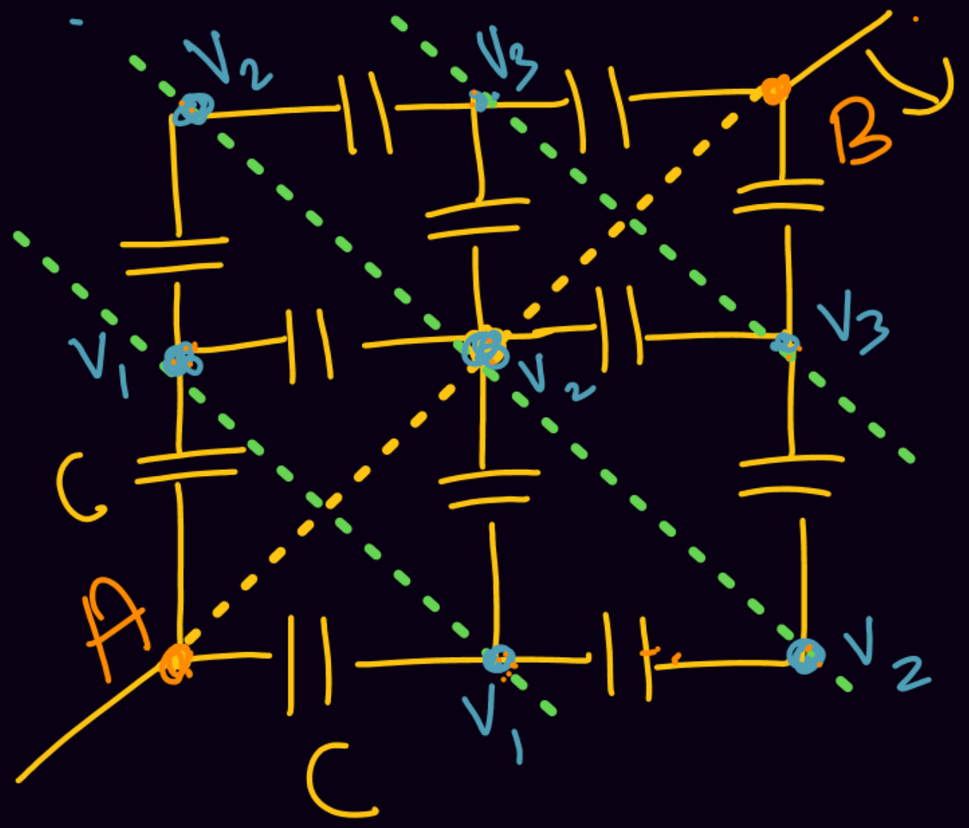
→ Not an axis of sym.

$\left(\frac{4R}{3} + 2R\right) \| 2R$

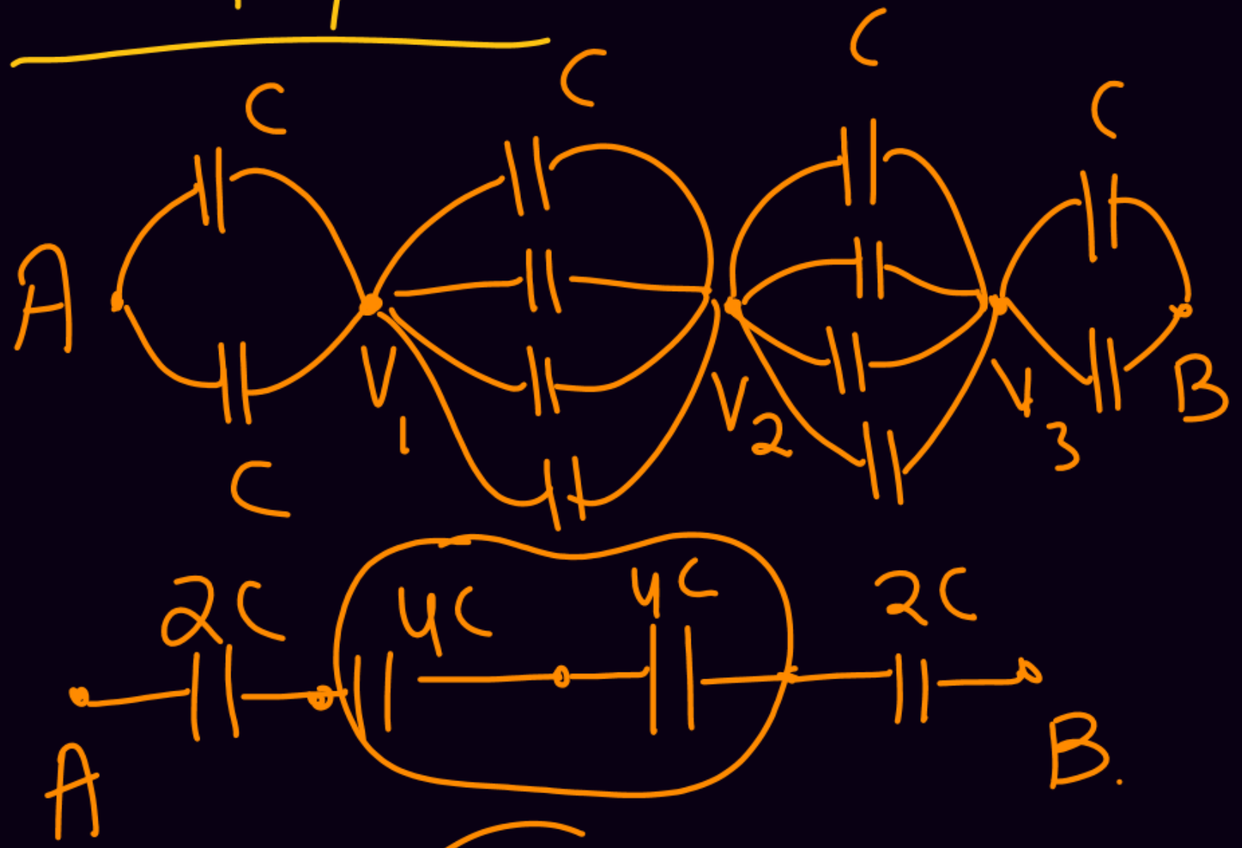
$$\left(\frac{4R}{3} + 2R\right) \parallel 2R$$

$$\frac{10R}{3} \parallel 2R$$

$$\frac{\frac{10R}{3} \times 2R}{\frac{10R}{3} + 2R} = \frac{\frac{20R}{3}}{\frac{16}{3}} = \frac{5R}{4}$$

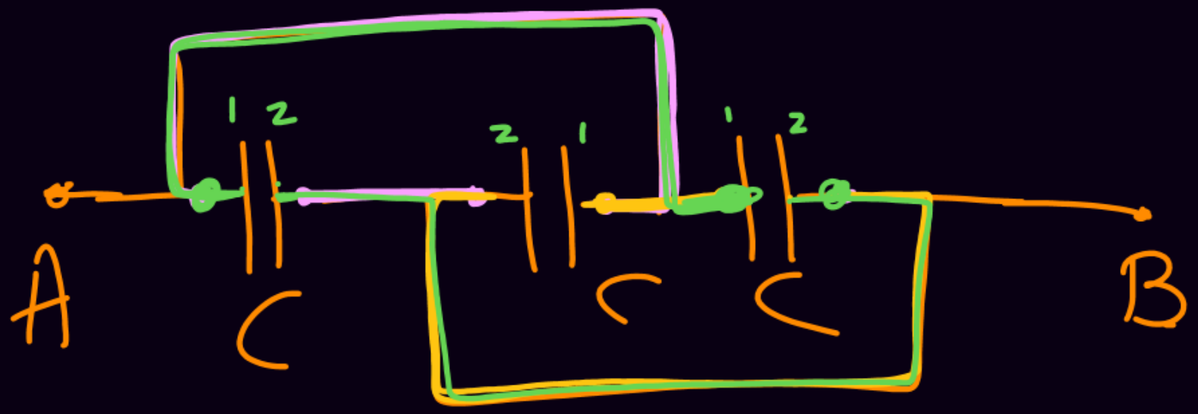


axis of sym



$\frac{2C}{3}$ Ans

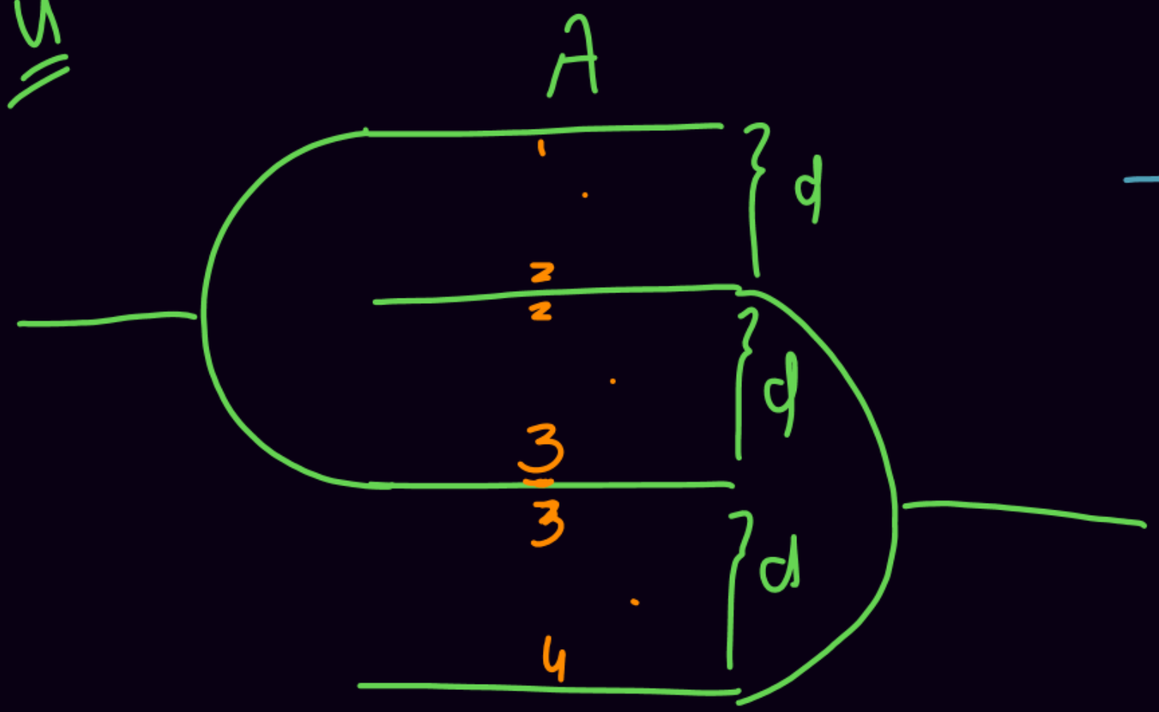
(3)

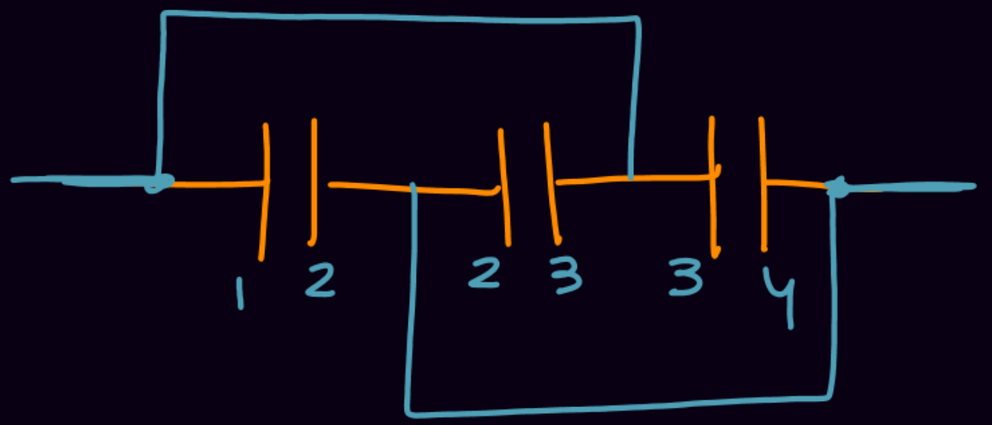


Find C_{eq}?

$C_{eq} = 3C$

11

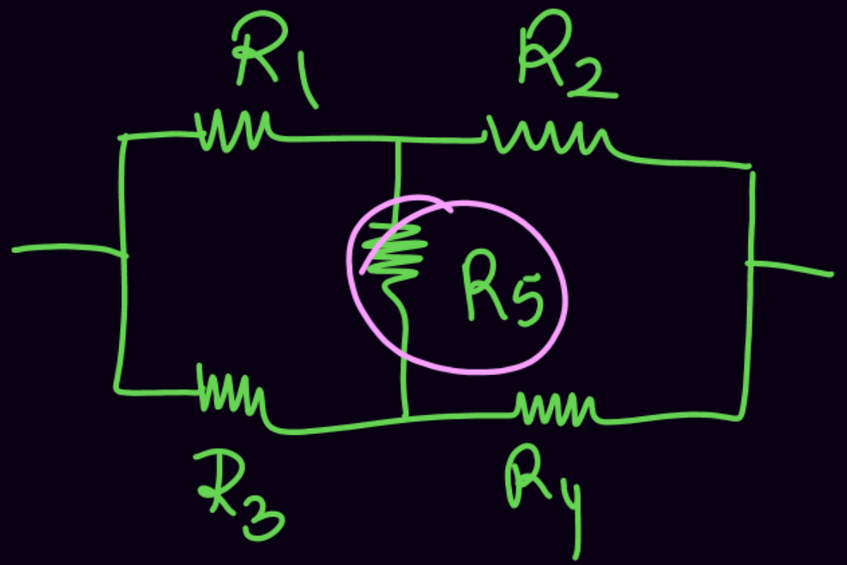


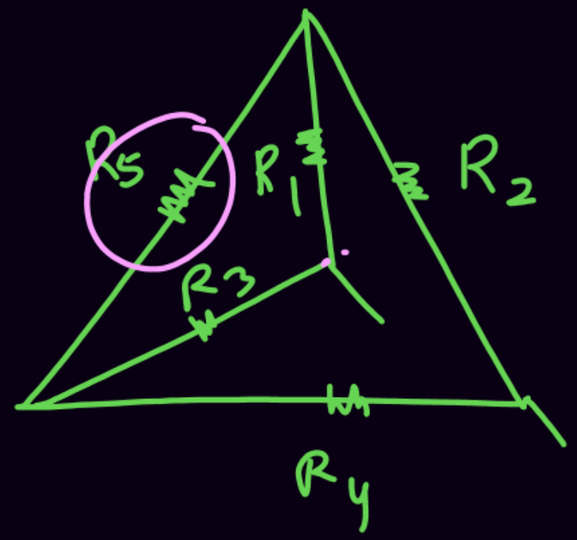


Ans 3C

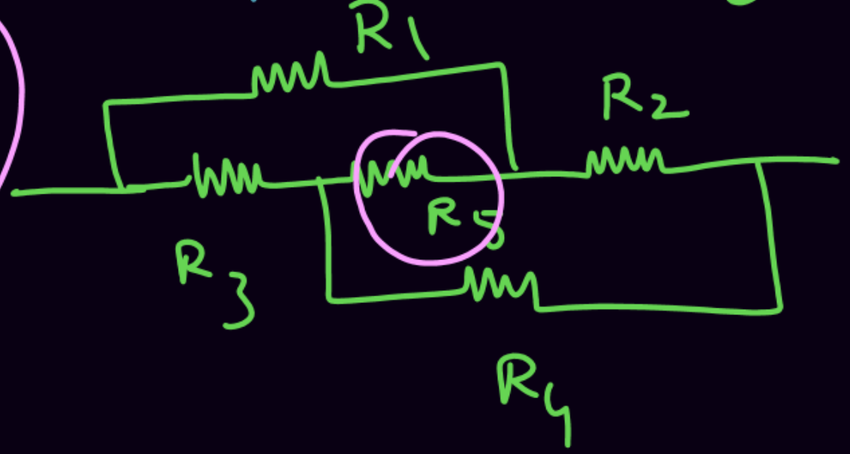
$$\frac{3\varepsilon_0 A}{d}$$

5 Wheatstone bridge

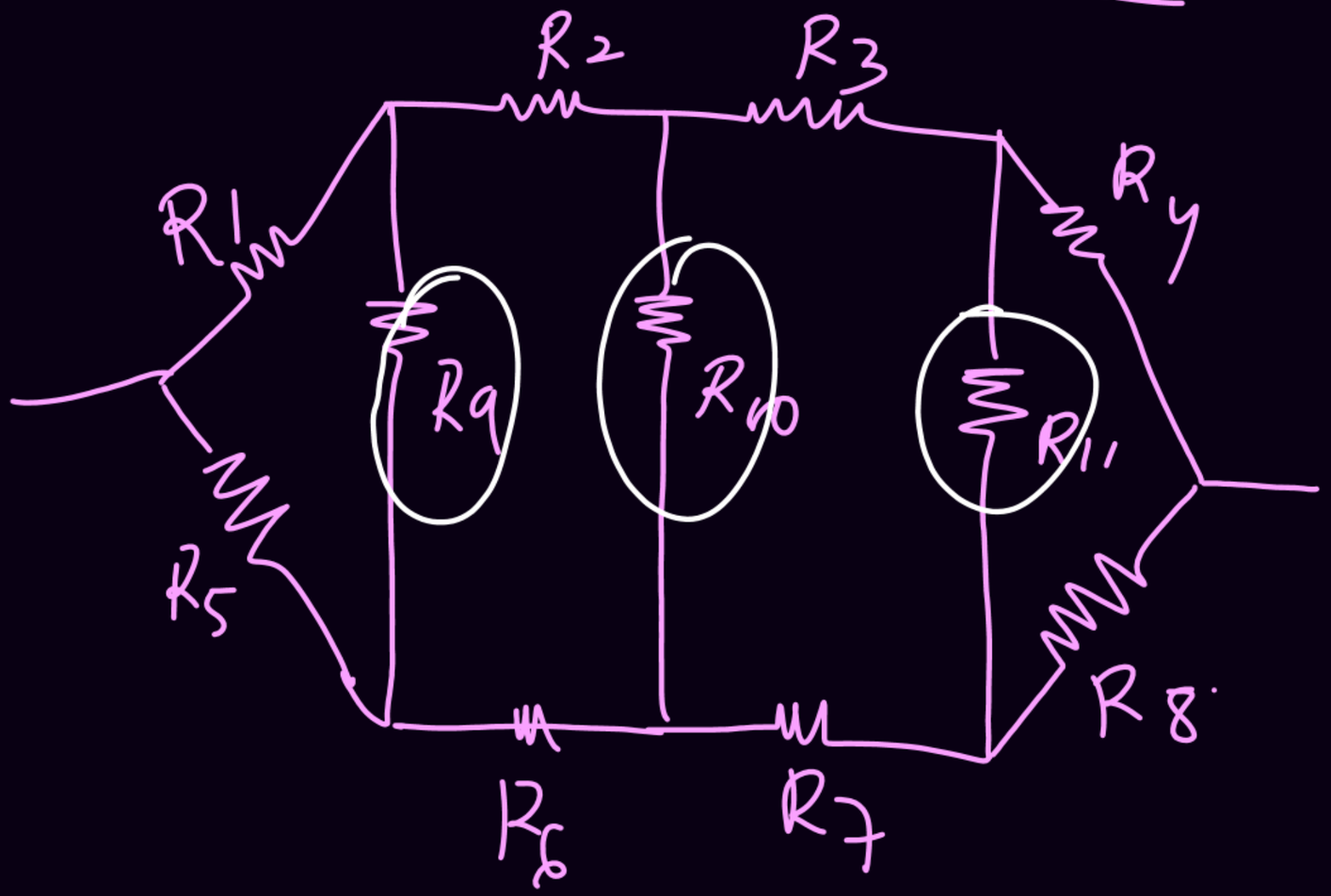




$$\frac{R_1}{R_3} = \frac{R_2}{R_4}$$



6 Extended wheatstone bridge



$$\frac{R_1}{R_5} = \frac{R_2}{R_6} = \frac{R_3}{R_7} = \frac{R_4}{R_8}.$$

R_9, R_{10}, R_{11} will be removed.

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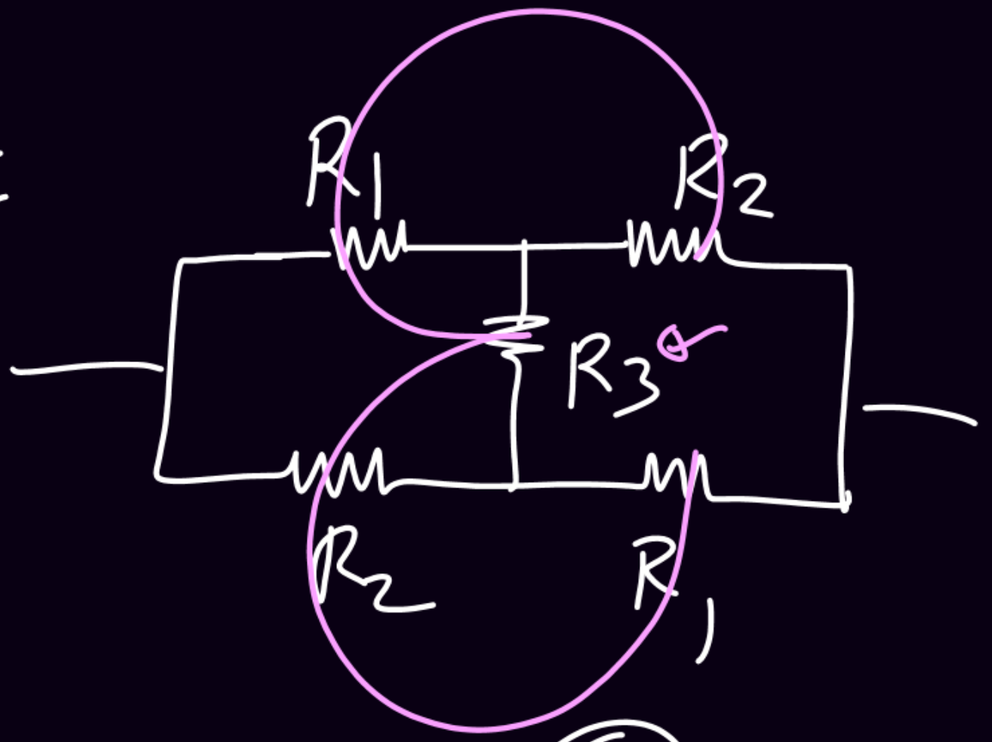
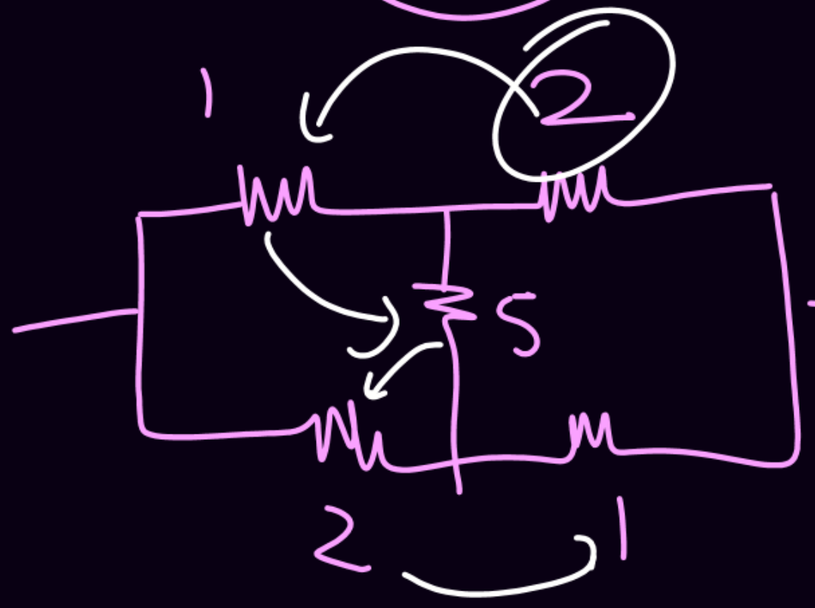


$$\frac{R_1}{R_2} \neq \frac{R_2}{R_1}$$

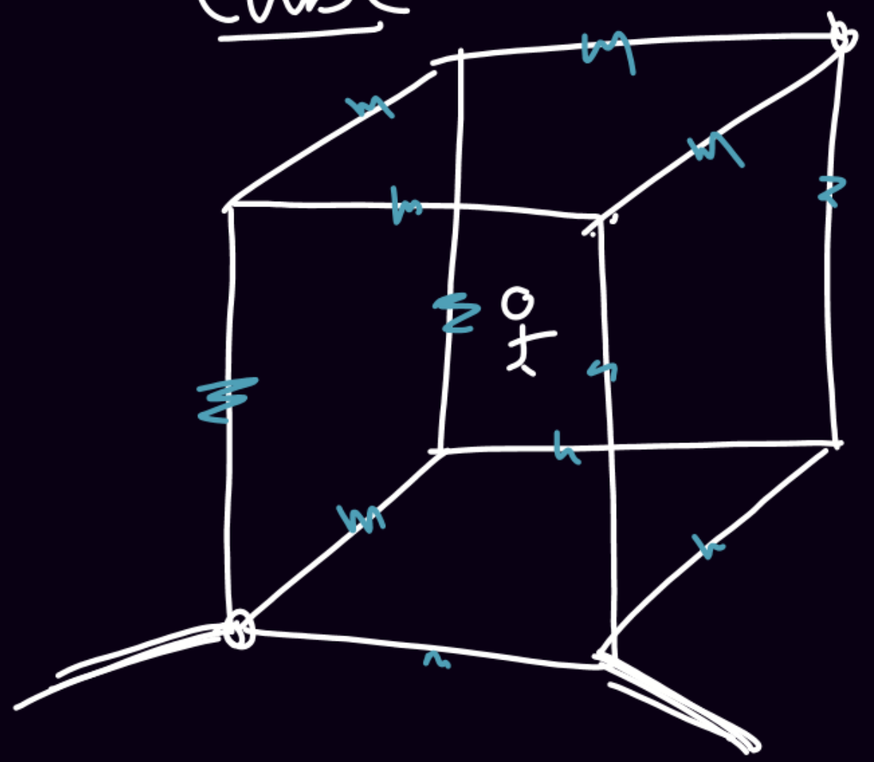
$$R_{eq} = \frac{R_2R_1 + R_1R_3 + R_3R_2 + R_2R_1}{R_2 + R_1 + \textcircled{2}R_3}$$



$$R_{eq} = \frac{2+5+10+2}{2+1+2\times 5} = \frac{19}{13}\,\Omega$$

(8)

Cube



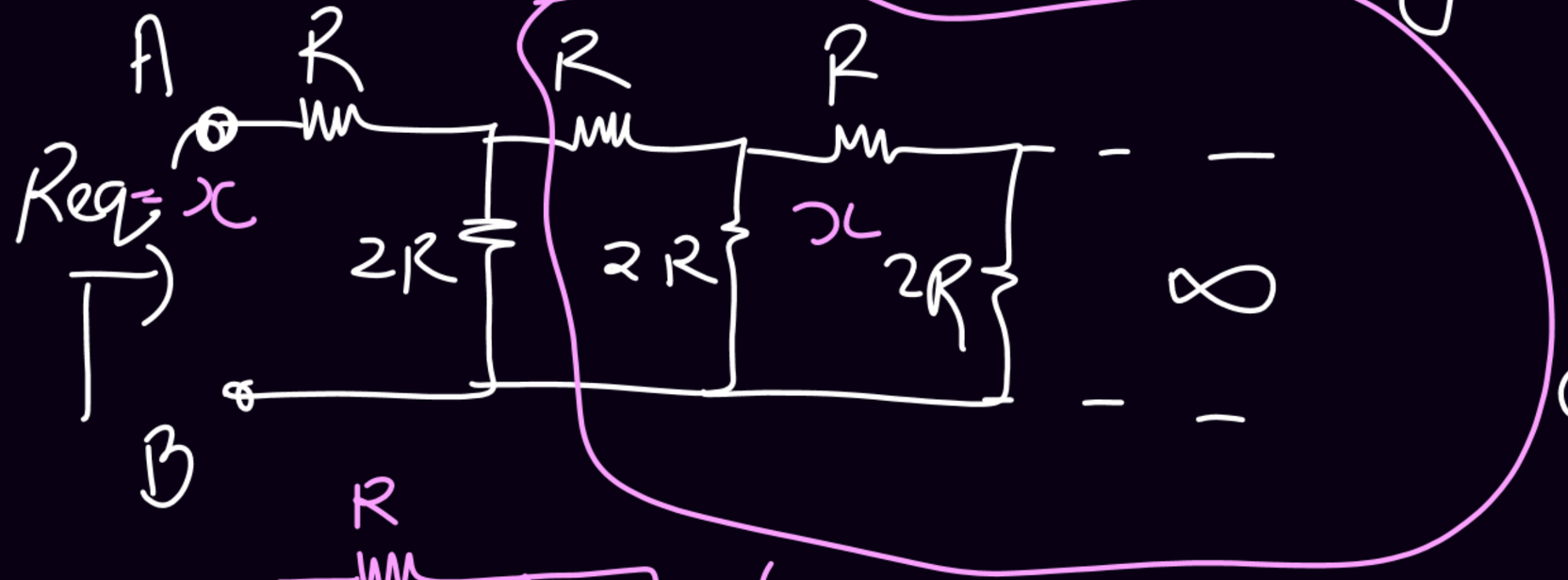
	Edge	Face diag.	Body diag
Res.	$\frac{7}{12}R$	$\frac{9}{12}R$	$\frac{10}{12}R$
Cap.	$\frac{12}{7}C$	$\frac{12}{9}C$	$\frac{12}{10}C$

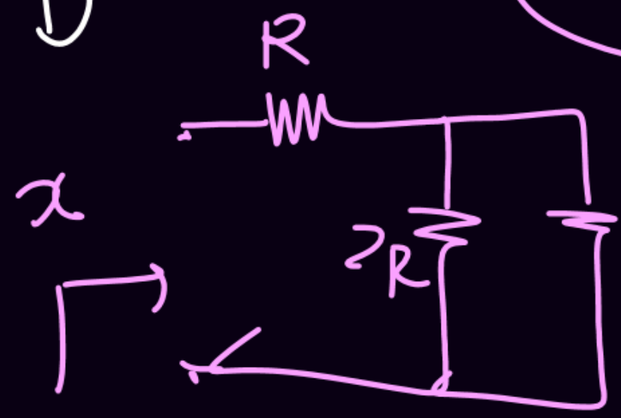
Face diag. $\frac{3R}{4}$

$\frac{3}{4}\frac{9}{12}R$ $\frac{5}{6}\frac{10R}{12}$

Body diag. $\frac{\sqrt{3}R}{4}$ $\frac{5R}{6}$ $\frac{5R}{6}$

⑨ Infinite ladder





$$(2R \parallel x) + R = x$$

$$\frac{2Rx}{2R+x} + R = x$$

$$2Rx + 2R^2 + Rx = 2Rx + x^2$$

$$x^2 - Rx - 2R^2 = 0$$

$$y = 6 + \frac{1}{\infty - 1} = \infty$$

$$y = 6 + \frac{1}{y}$$

$$y = 6 + \cfrac{1}{6 + \cfrac{1}{6 + \cfrac{1}{6 + \cfrac{1}{6 + \cfrac{1}{6 \cdots \infty}}}}}$$

Thank You Lakshyians