EEEE105L TUTORIAL SHEET - 01

SOLUTIONS

1) Fig.1 $R_{AB} = 4k + (12k \,||\, 24k) = 12k\Omega$

$I = V/R = \frac{24V}{12k\Omega} = 2mA \quad P = V \cdot I = 48mW$

Fig. 2 $R_{AB} = 910\Omega + [(6k\Omega + 6k\Omega) \,||\, (0.8k\Omega + 0.4k\Omega)]$

$= 2k\Omega$

$I = V/R = 24/2k\Omega = 12mA \quad P = V \cdot I = 288mW$

Fig. 3: $R_{AB} = 1k\Omega + 1k\Omega + (3k \,||\, 12k \,||\, 12k) + 1k\Omega = 4k\Omega$

$I = V/R = 24/4k\Omega = 6mA \quad P = VI = 144mW$

Fig. 4: $R_{AB} = 2k\Omega + [16k\Omega \,||\, (2k + 2k + 2k + 2k)] = 7.3k\Omega$

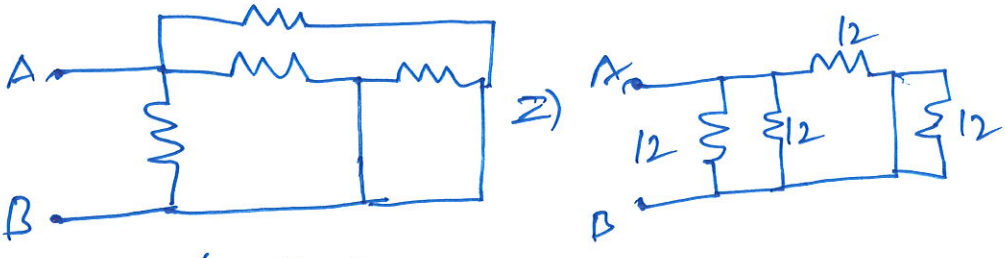
$I = V/R = 3.3mA \quad P = 79.2mW$

Fig. 5: $R_{AB} = 6\Omega + [12\Omega \,||\, [8\Omega + (6\Omega \,||\, 12\Omega)]]$

$= 12\Omega$

$I = V/R = 24/12 = 2A \quad P = 48W$

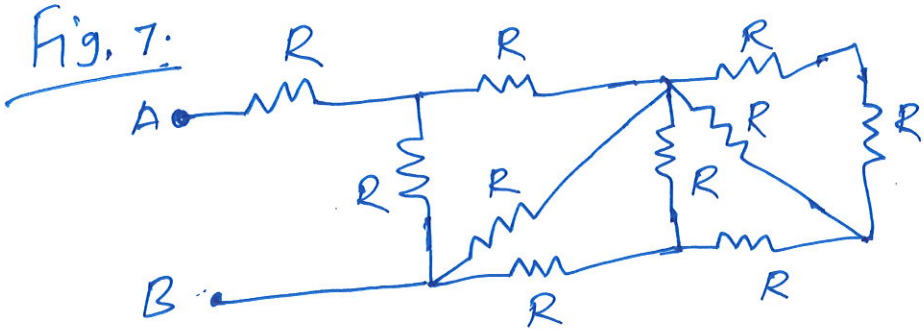
Fig. 6



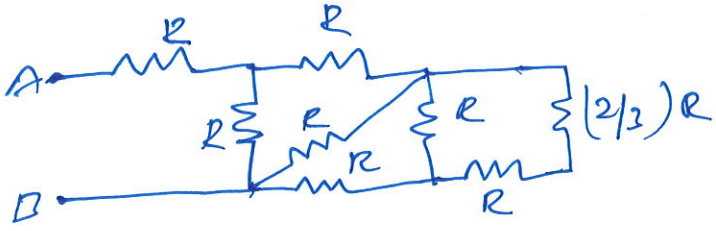
$R_{AB} = (12 \,||\, 12 \,||\, 12) = 4\Omega$

$V = 24/4 = 6A \quad P = V \cdot I = 144W$

2) Fig. 7:

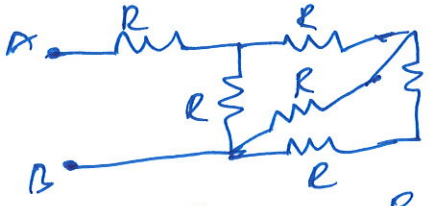


$(2R \| R) = 2/3\,R$



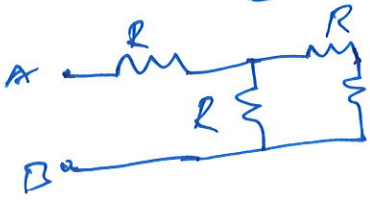
$\frac{2}{3}R + R = (5/3)R$

$R \| \frac{5R}{3} = \frac{5}{8}R$



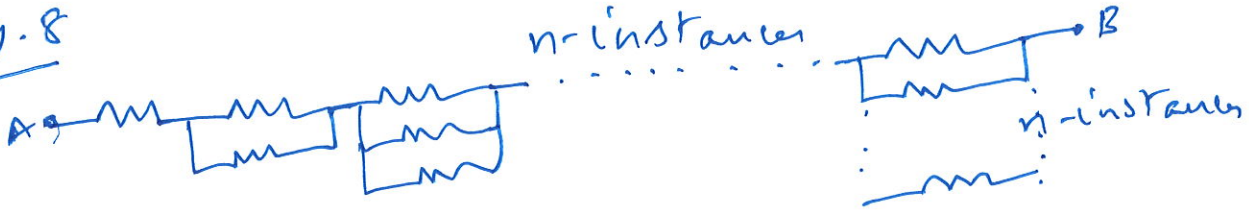
$\frac{5}{8}R + R = \frac{13}{8}R$

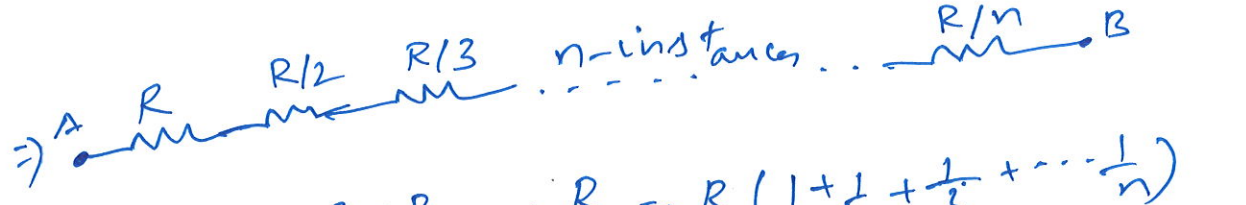
$\frac{13}{8}R \| R = 13/21\,R$



$\Rightarrow R_{AB} = \frac{89}{55}R$

Fig. 8





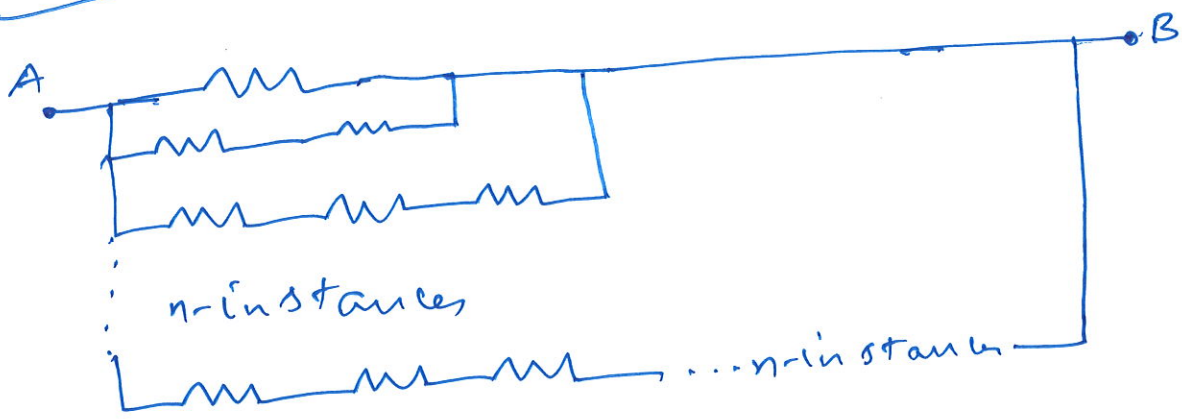
$\Rightarrow$

$R_{AB} = R + \frac{R}{2} + \frac{R}{3} \cdots \frac{R}{n} = R\left(1 + \frac{1}{2} + \frac{1}{3} + \cdots \frac{1}{n}\right)$

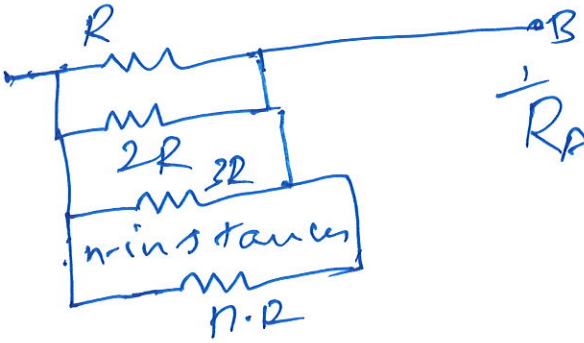
$R_{AB} = R \sum_n \frac{1}{n}$ $\quad n \to \infty$ $\quad \sum_n \frac{1}{n} \to \infty$

$\therefore R_{AB} = 0$

Fig. 9



$\Rightarrow$



$$\frac{1}{R_{AB}} = \frac{1}{R} + \frac{1}{2R} + \frac{1}{3R} + \cdots \frac{1}{nR}$$

$$= \frac{1}{R}\left[1 + \frac{1}{2} + \frac{1}{3} + \cdots \frac{1}{n}\right]$$

$$= \frac{1}{R} \cdot \sum_n \frac{1}{n}$$

$$R_{AB} = \frac{R}{\sum_n \frac{1}{n}} \quad \text{for } n \to \infty \; R_{AB} = 0$$