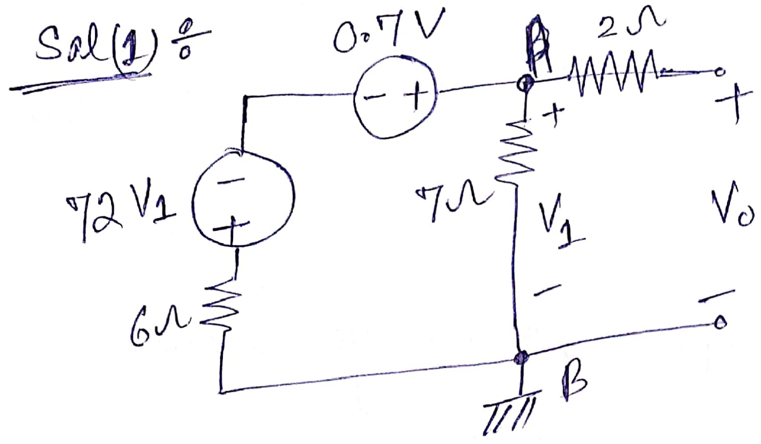
Sol(1):



Nodal analysis at A—

$$\frac{V_1}{7} + \frac{V_1 - 0.7 + 72V_1}{6} = 0$$

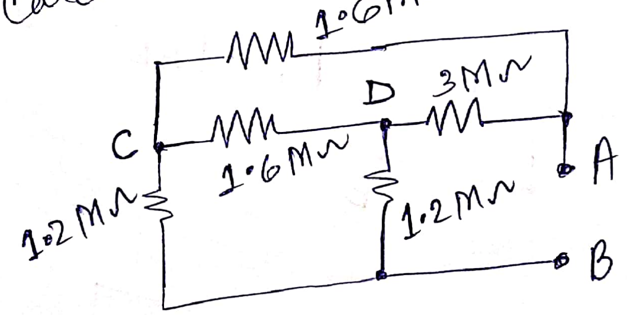
$$6V_1 + 7V_1 - 4.9 + 504V_1 = 0$$

$$V_1 = \left(\frac{4.9}{517}\right) = 9.48\,mV$$

$$\therefore V_0 = V_1 = 9.48\,mV$$

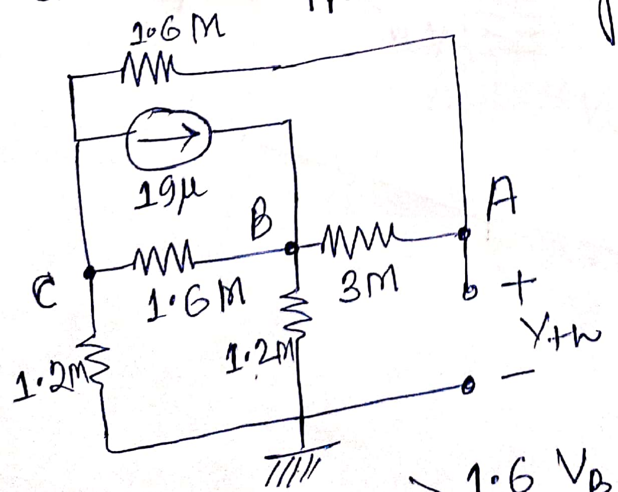
Sol(2):

To calculate R_{th}—



$$R_{th} = R_{AB} = 1.66\,M\Omega$$

To Calculate V_{th}—



By Nodal analysis—

$$\frac{V_A}{3} + \frac{V_A - V_C}{1.6} = 0$$

$$1.6V_A + 3V_A - 3V_C = 0$$

$$4.6V_A - 3V_C = 0 \quad \text{— (1)}$$

$$\frac{V_B - V_A}{3} + \frac{V_B}{1.2} + \frac{V_B - V_C}{1.6} = 19$$

$$1.6V_B - 1.6V_A + 4V_B + 3V_B - 3V_C = 91.2$$

$$8.6V_B - 1.6V_A - 3V_C = 91.2 \quad \text{— (2)}$$

$$\frac{V_C}{1.2} + \frac{V_C - V_B}{1.6} + \frac{V_C - V_A}{1.6} + 19 = 0$$

$$-3V_A - 3V_B + 10V_C = -91.2 \quad \text{— (3)}$$

$\therefore V_A = -5.84$ Volt $= V_{th}$

$\therefore$ Power supplied to $1M\Omega$ resistor connected to N/w

$$= \left(\frac{5.84}{1.66+1}\right)^2 \times 1 = 4.82\ \mu W$$

Sol ③: there is no any independent voltage source, (in all cases)

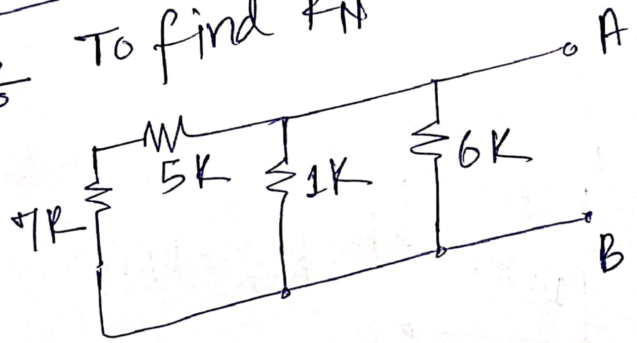
hence $V_{th} = 0$

$\therefore R_{th} = R_{ab} = 4+10+2||(21+11)$

$\therefore R_{th} = R_{ac} = 4+2||(21+11)+12$

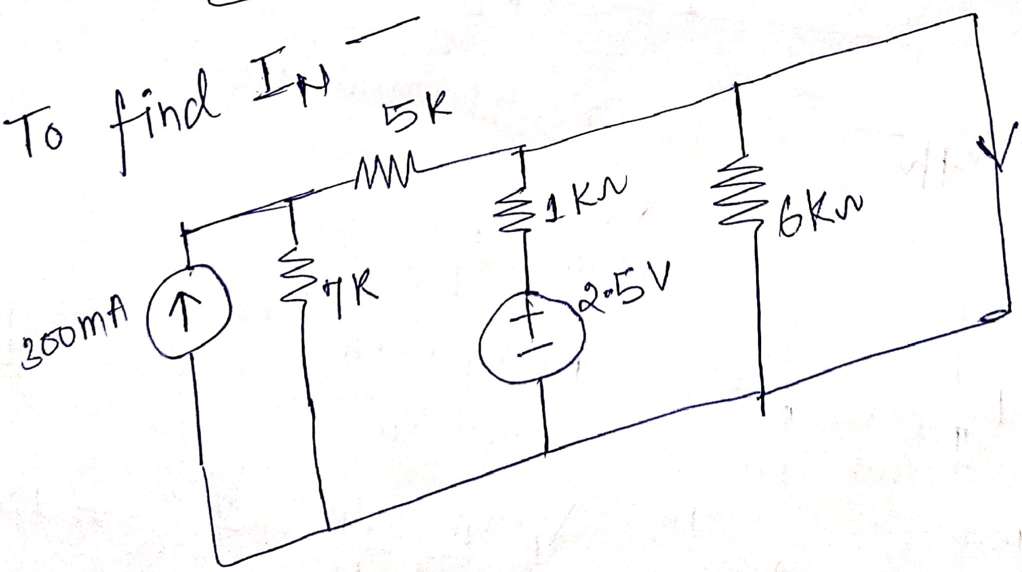
$\therefore R_{th} = R_{bc} = 12+10$

Sol ④: To find R_N —



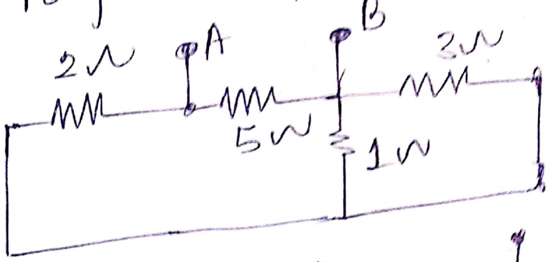
$R_N = R_{AB} = 6||1||(7+5)$

To find I_N —



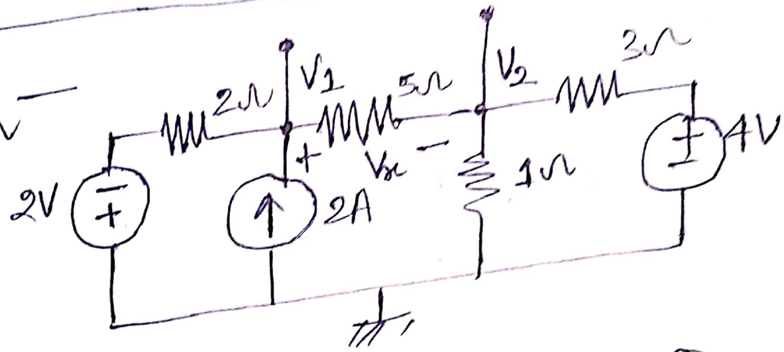
$I_N = I_{SC}$

Sol ⑤ :- To find R_{th} —



$R_{th} = R_{AB} = 5 \| [2 + (1 \| 3)]$

To find V_{th} —

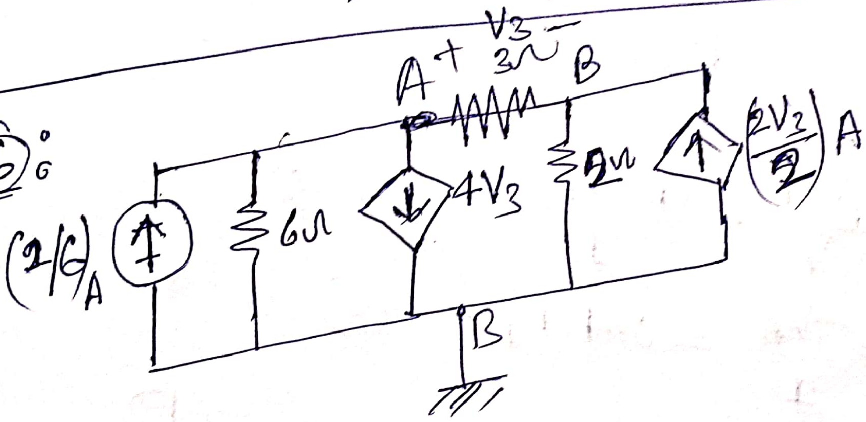


at Node V_1 — $\frac{V_1+2}{2} + \frac{V_1-V_2}{5} = 2$ — ①

at Node V_2 — $\frac{V_2-V_1}{5} + \frac{V_2}{1} + \frac{V_2-4}{3} = 0$ — ②

$V_{th} = V_x = (V_1 - V_2)$

Sol ⑥ :



at Node A → $\frac{V_A}{6} + \frac{(V_A-V_B)}{3} + 4V_3 = \frac{1}{3}$ — ①

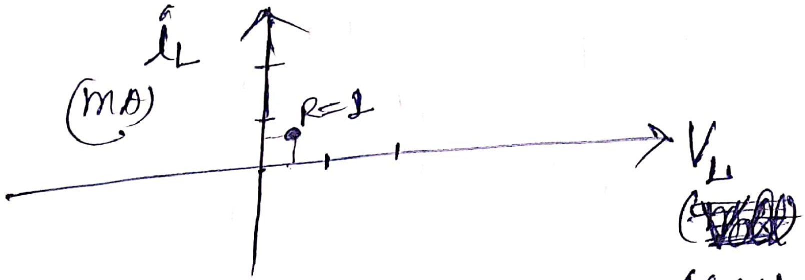
at Node B → $\frac{V_B}{2} + \frac{V_B-V_A}{3} = V_3$ — ②

$V_A - V_B = V_3$ — ③

Sol(7): $\overset{\circ}{i}_L = \dfrac{V_L}{R}$ — ①

where, $\hat{i}_L = \left(\dfrac{3}{5+R}\right) mA$

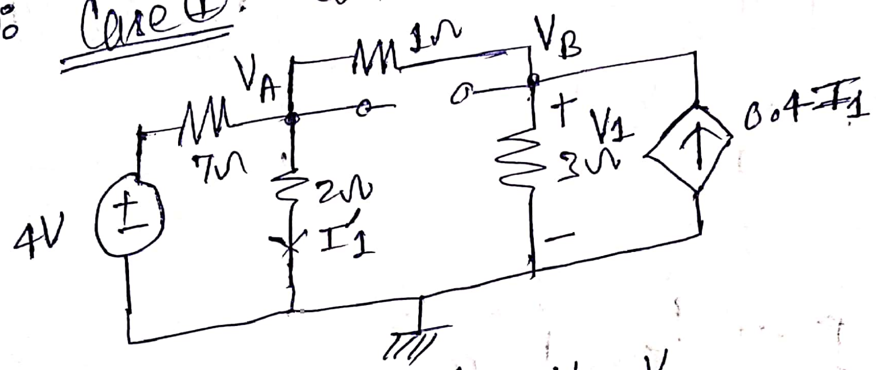
& $V_L = \left(\dfrac{R}{R+5}\right) 3$ Volt



Take R=1, $i_L = 0.5\,mA$ & $V_L = 0.5$ Volt

Take R=2, ⟶ follow same

Sol(8): Case ①: Consider 4V source



By Superposition-

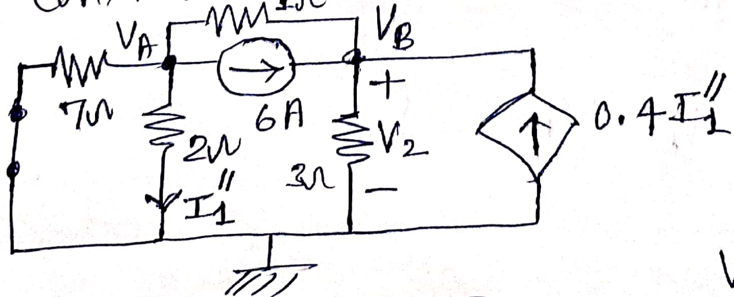
$\therefore V = V_1 + V_2$

At Node A— $\dfrac{V_A}{2} + \dfrac{V_A - 4}{7} + \dfrac{V_A - V_B}{1} = 0$ — ①

At Node B— $\dfrac{V_B}{3} + \dfrac{V_B - V_A}{1} = 0.4 I_1'$ — ②

$\dfrac{V_A}{2} = I_1'$ — ③ $\qquad V_B = V_1$ — ④

Case ②: Consider 6A source



$\dfrac{V_A}{2} + \dfrac{V_A}{7} + \dfrac{V_A - V_B}{1} + 6 = 0$ — ⑤

$\dfrac{V_B}{3} + \dfrac{V_B - V_A}{1} = 6 + 0.4 I_1''$ — ⑥

$\dfrac{V_A}{\cancel{2}} = I_1''$ — ⑦

$V_B = V_2$ — ⑧

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