Q1

The circuit shows a $12\,\Omega$ resistor from a 42V source to node V_1, a $6\,\Omega$ resistor from V_1 to ground, and a $3\,\Omega$ resistor from V_1 to a 35V source.

$\underline{\text{Soln}} :\to$ ⓐ
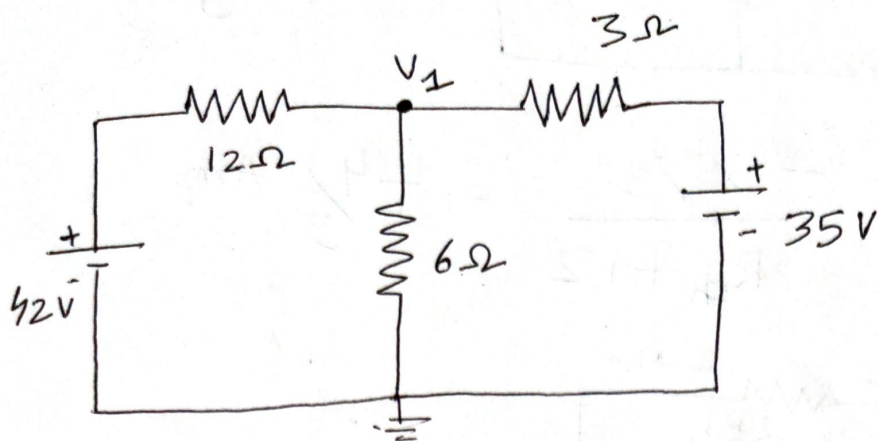
$$\frac{V_1 - 42}{12} + \frac{V_1}{6} + \frac{V_1 - 35}{3} = 0$$

$$\frac{V_1}{12} + \frac{V_1}{6} + \frac{V_1}{3} = \frac{42}{12} + \frac{35}{3}$$

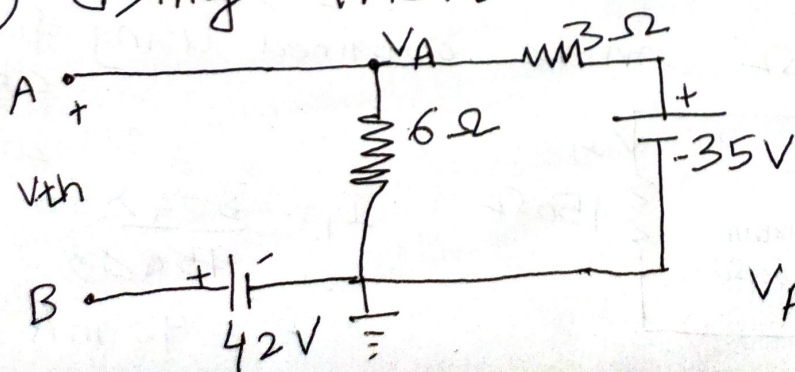$$V_1\left[\frac{1 + 2 + 4}{12}\right] = \frac{42 + 140}{12} = \frac{182}{12}$$

$$V_1 = \frac{182}{7} = \underline{26\ \text{Volt}}$$

$$\text{Current in } 12\,\Omega = \frac{V_1 - 42}{12}$$

$$= \frac{26 - 42}{12} = \frac{-16}{12} = -\frac{4}{3}\text{Amp}.$$

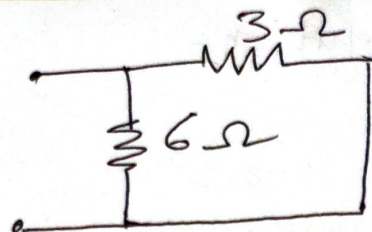ⓄR

ⓑ Using Thevenins Theorem For $12\,\Omega$ resistor

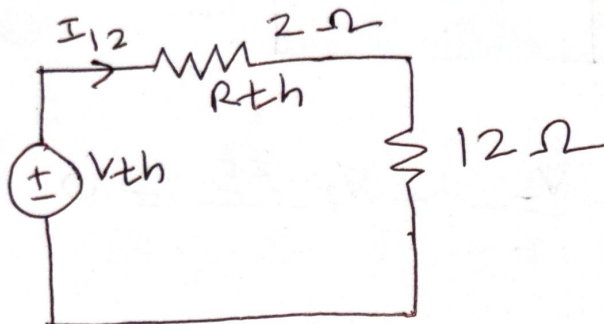$$V_A = \frac{6}{9}^2 \times 35\text{V}$$

$$= \frac{70}{3}\ \text{volt}$$

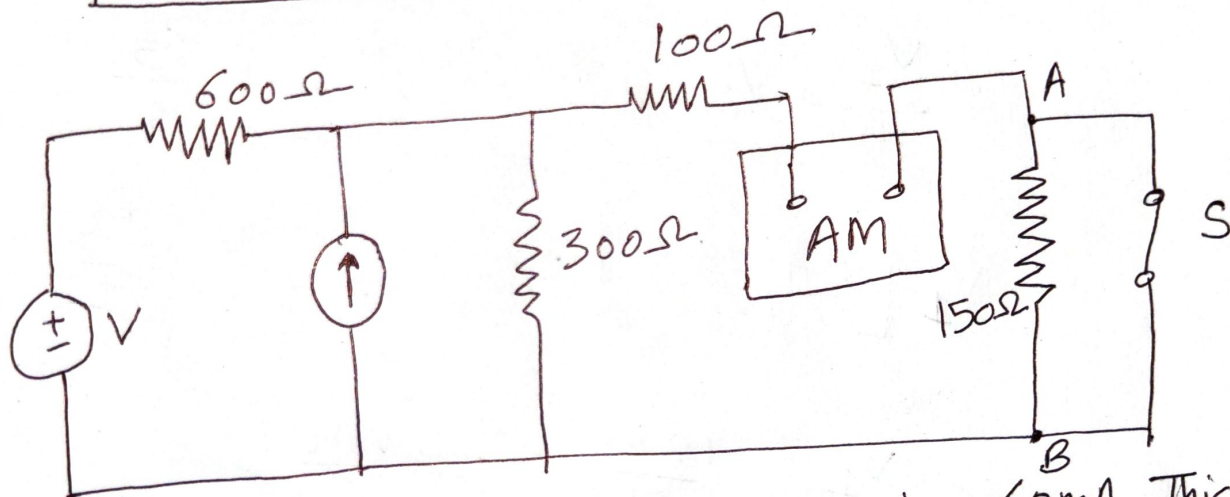$$V_A - V_B = V_{th} = \frac{70}{3} - 42 = \boxed{\frac{-56}{3}\text{V}}$$

$R_{th} =$

$R_{th} = \dfrac{18}{9} = 2\,\Omega$

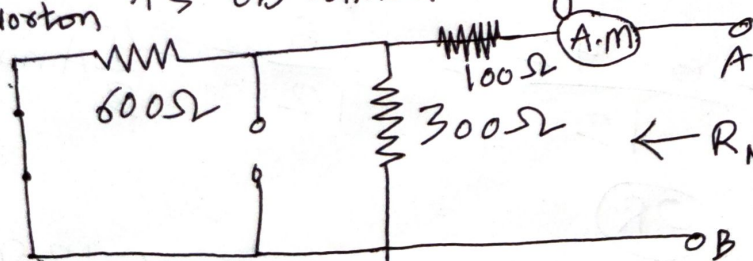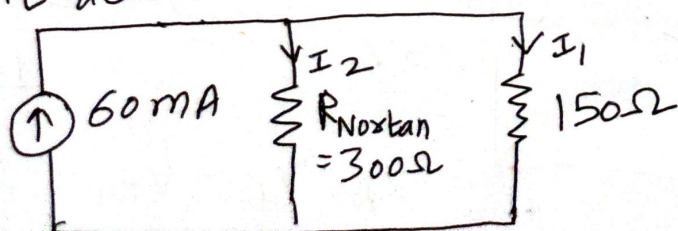$$I_{12} = \dfrac{-56/3}{R_{th} + 12} = -\dfrac{4}{3}\ Amp$$

Q②

With switch 'S' closed, ammeter current $= 60\,mA$. This is the short circuit current across AB.

The R_{Norton} is obtained using following circuit

$\leftarrow R_{Norton} = \dfrac{\overset{\scriptscriptstyle 2}{\cancel{300}} \times 600}{\underset{3}{\cancel{900}}} + 100$

$= 200 + 100$

$= 300\,\Omega$

Current across $150\,\Omega$ can be obtained using following ckt.

$I_1 = \dfrac{\overset{6}{\cancel{300}} \times \overset{2}{\cancel{60}} \times \overset{20}{}}{\underset{3}{\cancel{450}}}$

$I_1 = 40\,mA$