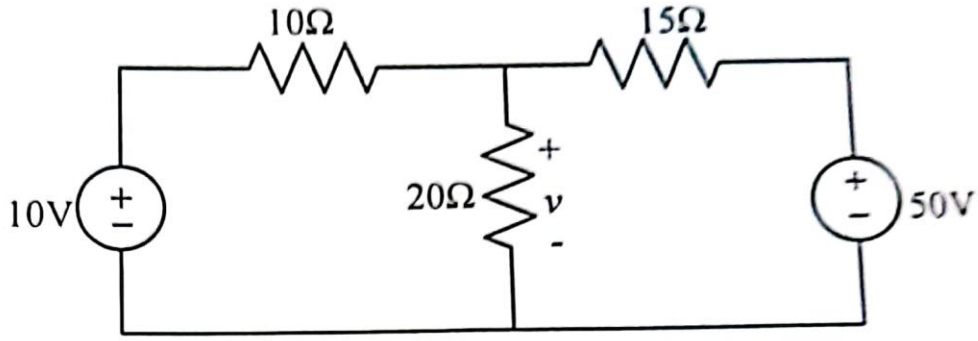
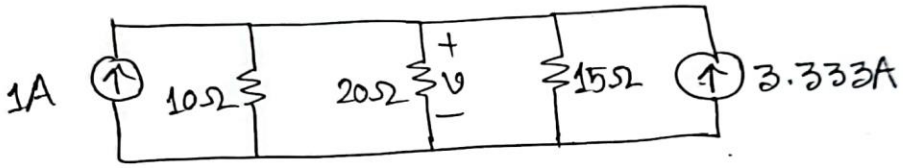
1. Using source transformation, find v in the following circuit. [5]

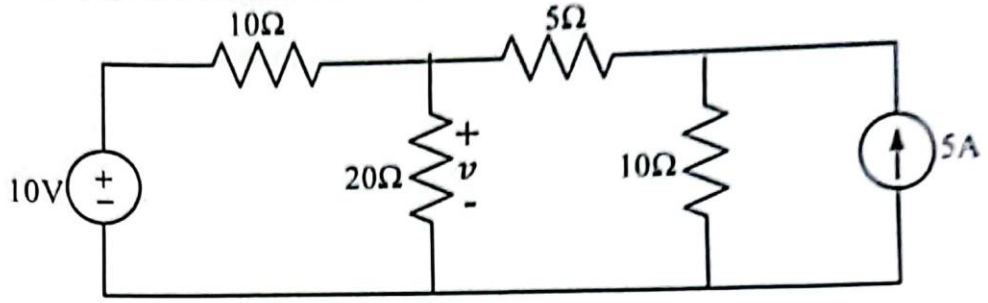




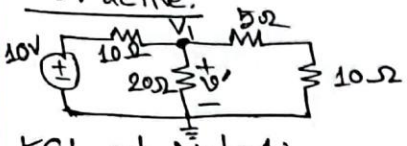
$$i = \frac{4.333\text{A}}{(6+20)\Omega} \times 6\Omega = 0.999\text{A}$$

$$v = 20i = 20 \times 0.999 = 19.98\text{V} = 20\text{V}$$

2. Using superposition theorem, find v in the following circuit. [5]



10V active:



KCL at Node 1:

$$\frac{V_1 - 10}{10} + \frac{V_1}{20} + \frac{V_1}{15} = 0$$

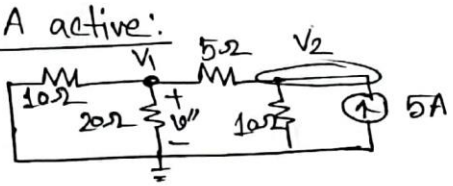
$$V_1\left(\frac{1}{10} + \frac{1}{20} + \frac{1}{15}\right) = 1$$

$$0.217\,V_1 = 1$$

$$V_1 = 4.615\ V$$

$\therefore v' = V_1 = 4.615V$

5A active:



KCL at Node 1:

$$\frac{V_1 - V_2}{5} + \frac{V_1}{20} + \frac{V_1}{10} = 0$$

$$V_1\left(\frac{1}{5} + \frac{1}{20} + \frac{1}{10}\right) + V_2\left(-\frac{1}{5}\right) = 0$$

$$0.35V_1 - 0.2V_2 = 0 \quad \text{——(i)}$$

KCL at Node 2:

$$\frac{V_2 - V_1}{5} + \frac{V_2}{10} = 5$$

$$V_1\left(-\frac{1}{5}\right) + V_2\left(\frac{1}{5} + \frac{1}{10}\right) = 5$$

$$-0.2V_1 + 0.3V_2 = 5 \quad \text{——(ii)}$$

$V_1 = 15.385V$

$V_2 = 26.923V$

$\therefore v'' = V_1 = 15.385V$

$\therefore v = v' + v''$

$= 4.615 + 15.385 = 20\ V$