Electrical Science: 2021-22
Tutorial 1
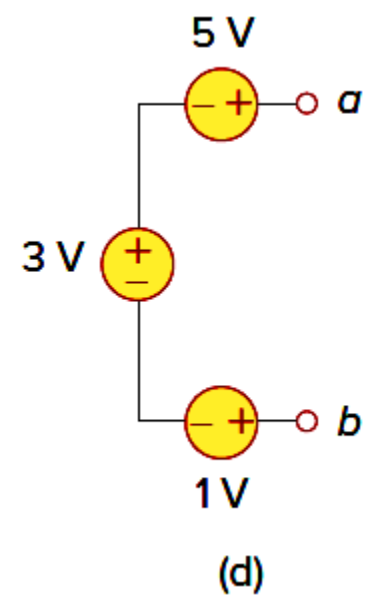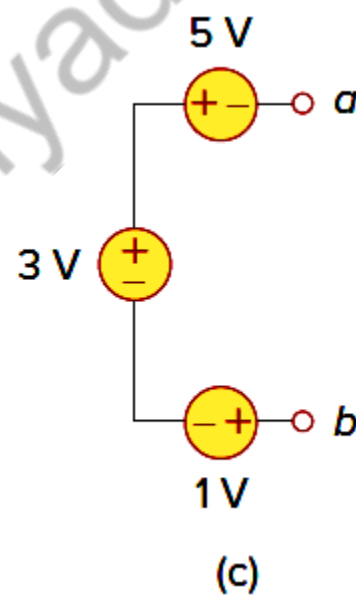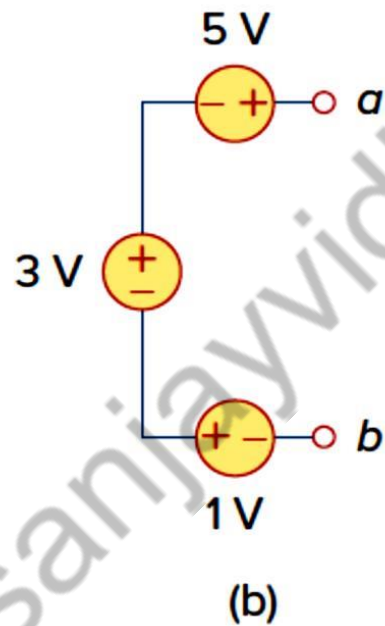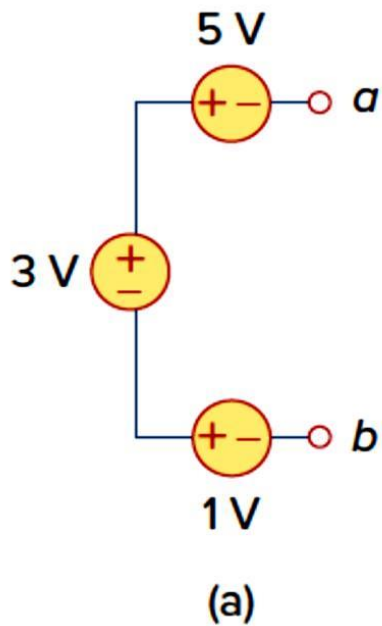# Power Sources

By Dr. Sanjay Vidhyadharan

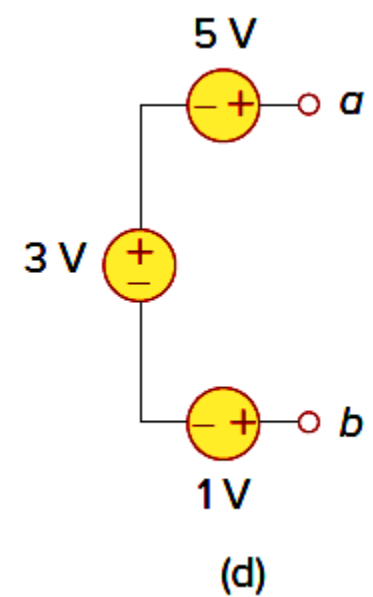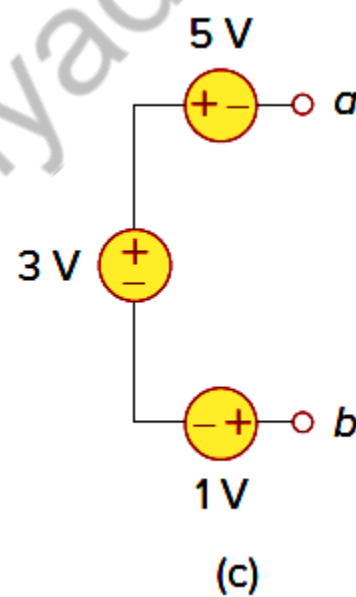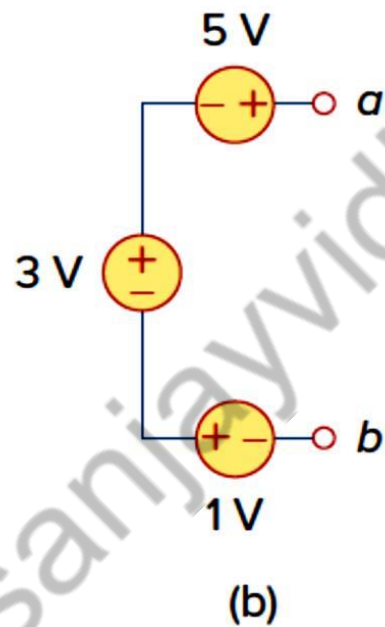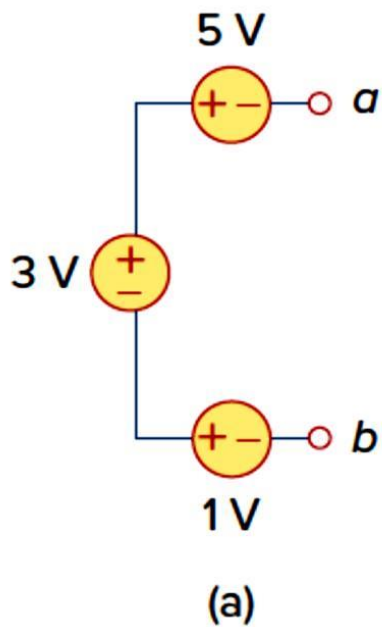# Problem 1

Which of the circuits in following figure will give you Vab = 7 V?

(a)   (b)   (c)   (d)

Problem 1

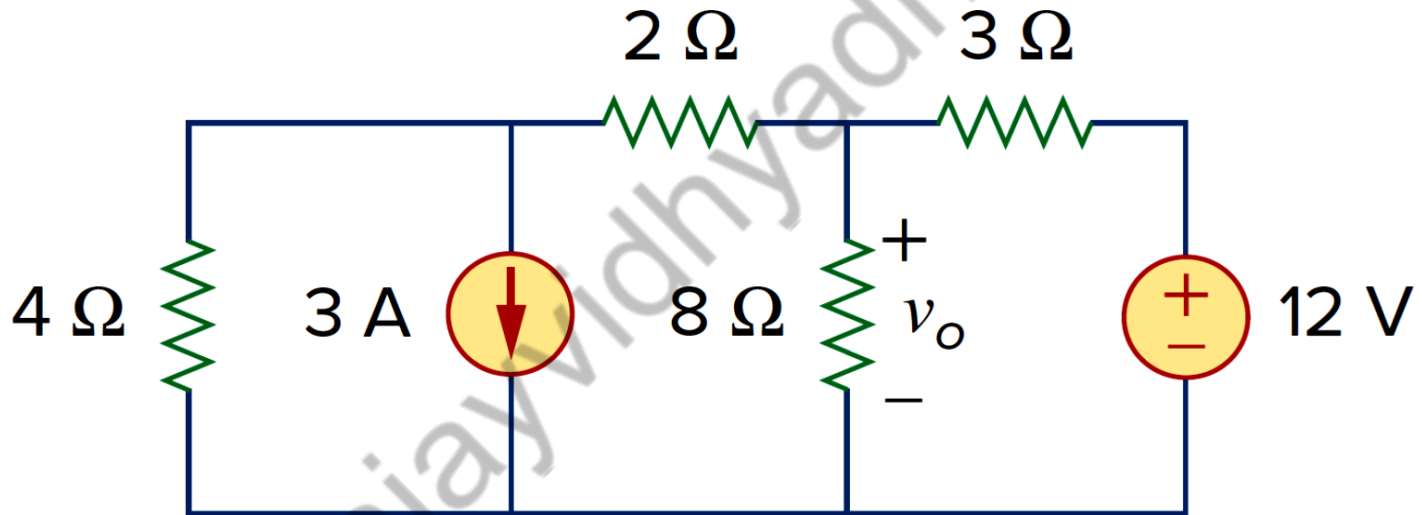Which of the circuits in following figure will give you Vab = 7 V?
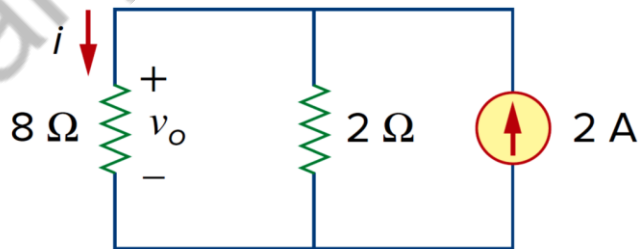

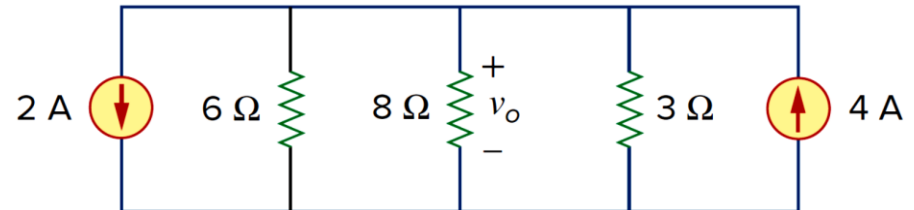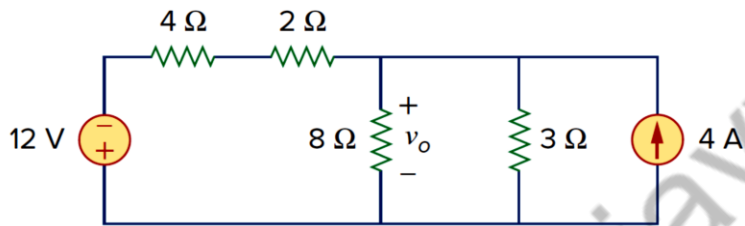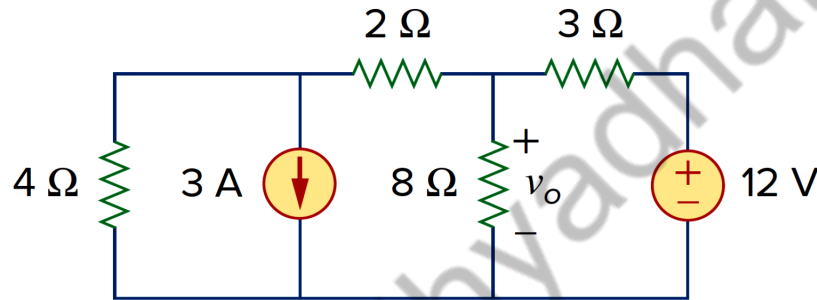(a)   (b)   (c)   (d)

Answer: (d)

Problem 2

Use source transformation to find v o in the circuit of below figure.

Problem 2

Use source transformation to find v_o in the circuit of below figure.

$$i = 2 \times \frac{2}{2+8} = 0.4\ A$$

$$v_o = 8i = 8(0.4) = 3.2\ V$$

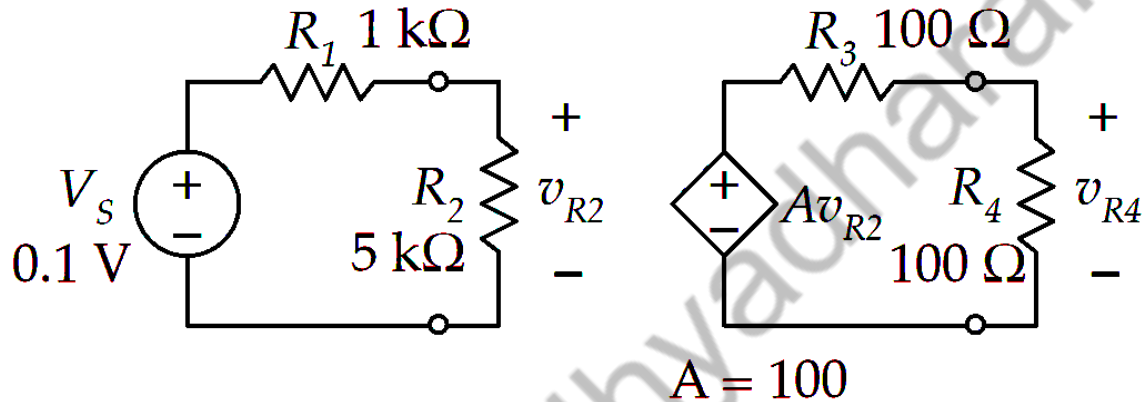# Problem 3

Find V_{R4}
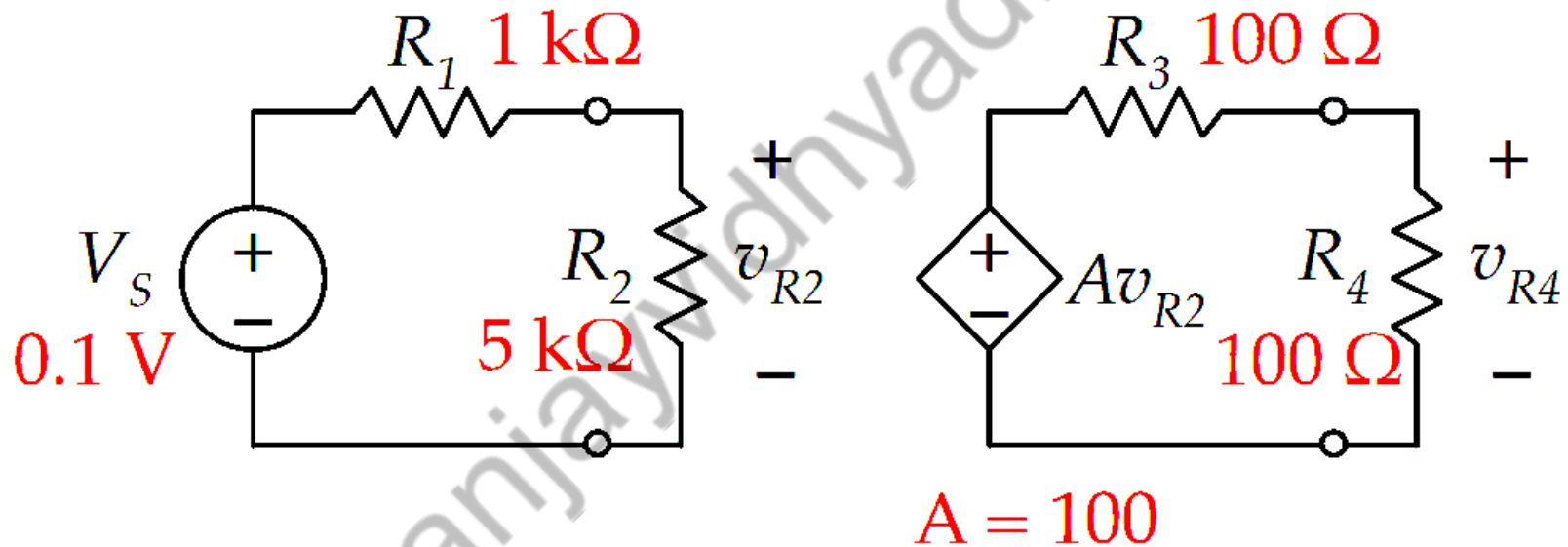
Problem 3

Find V_{R4}

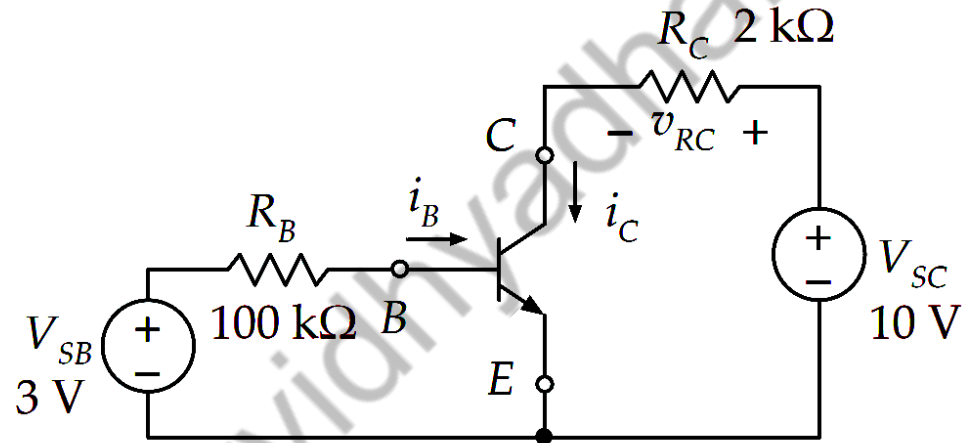$$v_{R2} = \frac{R_2}{R_2 + R_2} V_S = \frac{5\ k\Omega}{1\ k\Omega + 5\ k\Omega} (0.1\ V) = 0.0833\ V$$

$$v_{R4} = \frac{R_4}{R_4 + R_3} (Av_{R2}) = \frac{100\Omega}{100\Omega + 100\Omega} (100)\, v_{R2} = 50 v_{R2}$$

$$v_{R4} = (50)(0.0833\ V) = 4.17\ V.$$

Problem 4

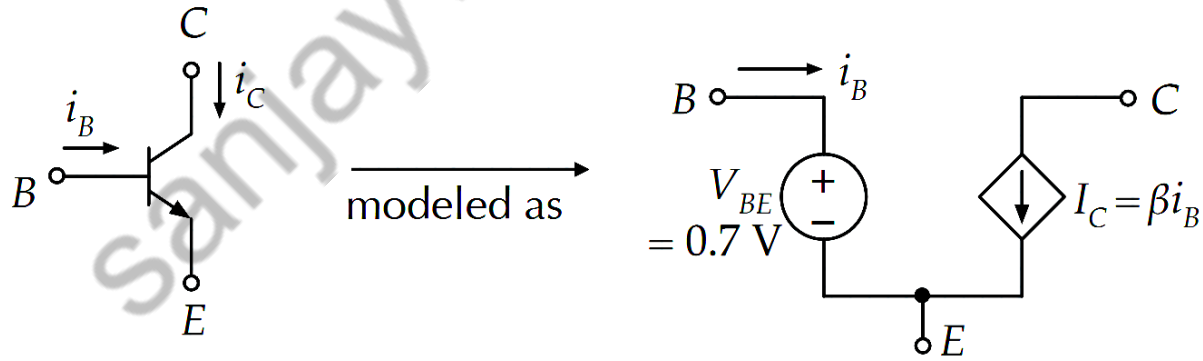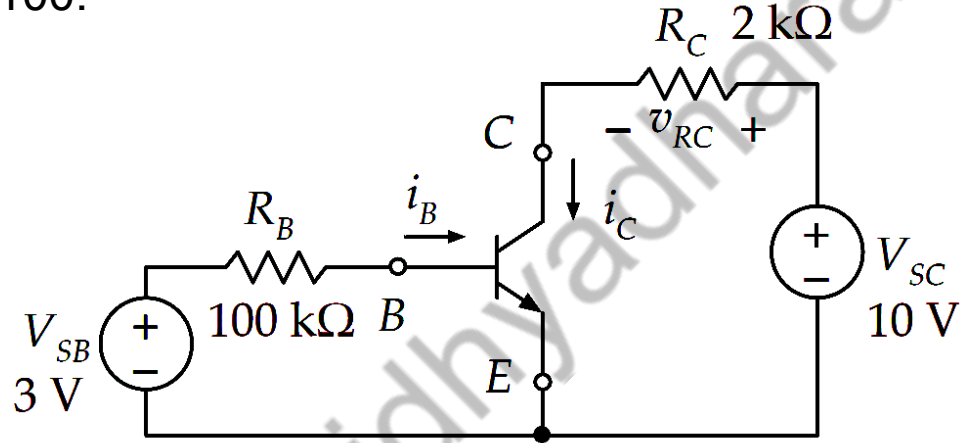Find V_{RC}

Problem 4

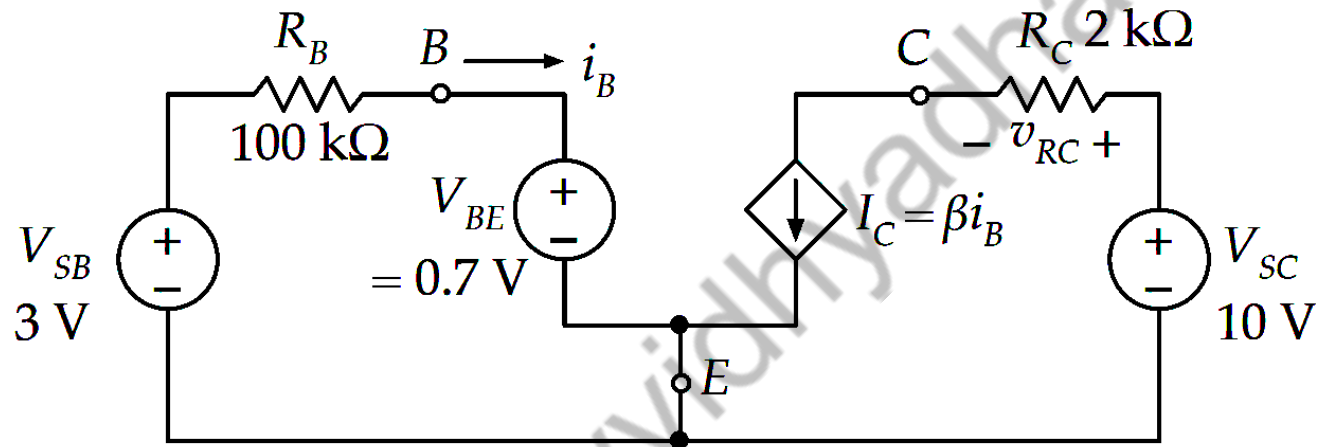Find V_{RC} Given $\beta = 100$.

Find V_{RC} Given β = 100.

Around the left-hand loop:
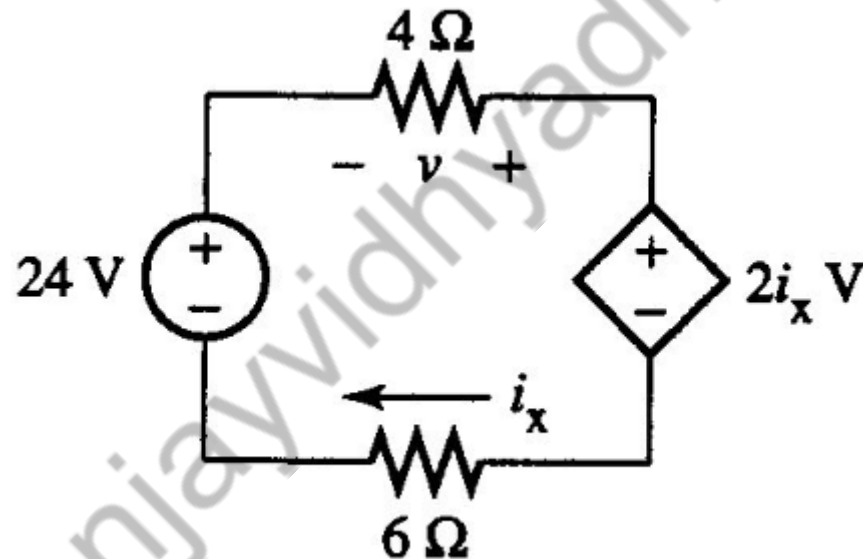
$V_{SB} - i_B R_B - V_{BE} = 0.$

$$\frac{V_{SB} - V_{BE}}{R_B} = \frac{3\text{ V} - 0.7\text{ V}}{100\text{ k}\Omega} = 0.023\text{ mA}$$

On the right: $I_C = \beta i_B = (100)(0.023\text{ mA}) = 2.3\text{ mA}.$

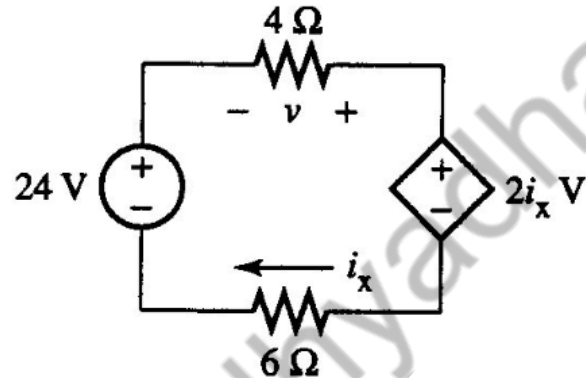Then: $v_{RC} = R_C I_C = (2\text{ k}\Omega)(2.3\text{ mA}) = 4.6\text{ V}.$ So easy!

Problem 5

Find the voltage v in the following circuit which contains a CCVS

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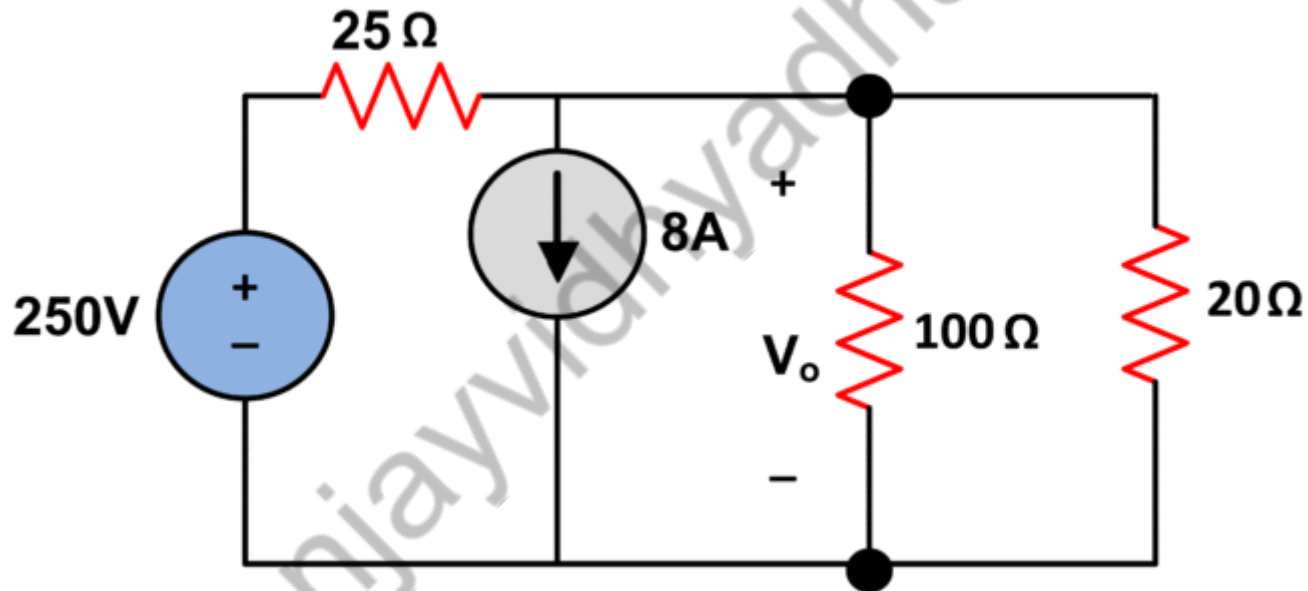$$v = \frac{4}{4+6}(v_c - 24) = \frac{2}{5}v_c - \frac{48}{5}$$

$$v_c = 2i_x = 2\left(\frac{24 - v_c}{10}\right) = \frac{24}{5} - \frac{v_c}{5}$$

$$6v_c = 24 \qquad v_c = 4 \ \ V$$

$$v = \frac{2}{5} \times 4 - \frac{48}{5} = -8 \ \ V$$
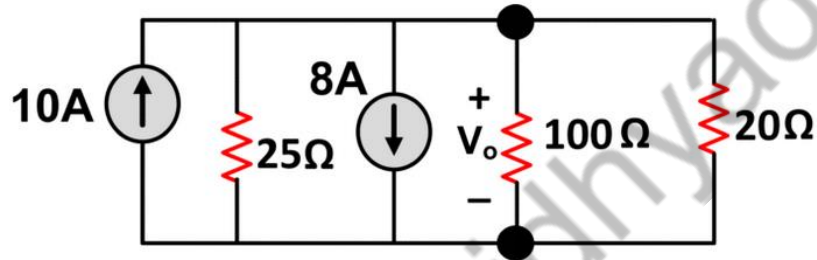
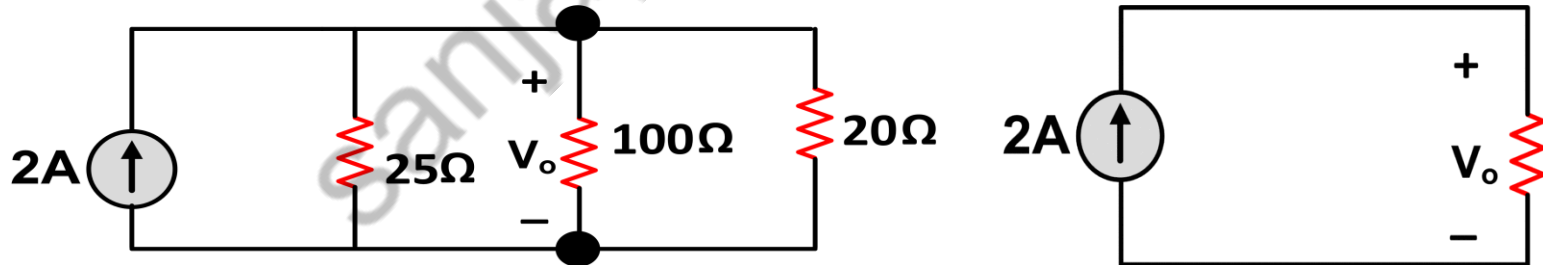# Problem 6

Find V_o using source Transformation

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Find V_o using source Transformation
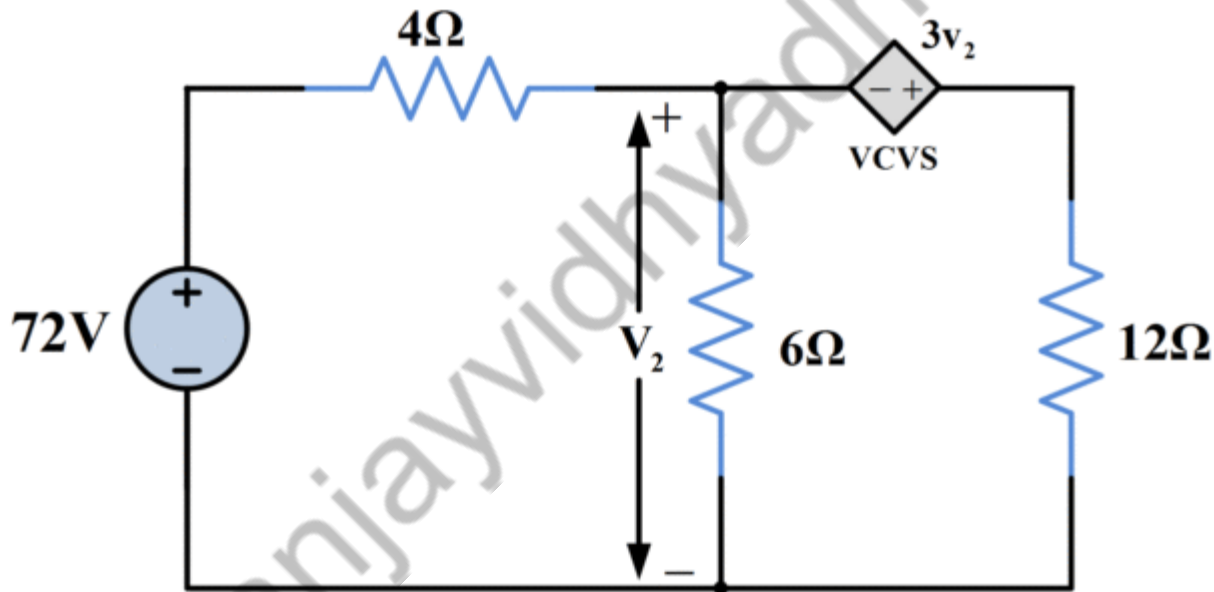
Converting 250V voltage source into current source.
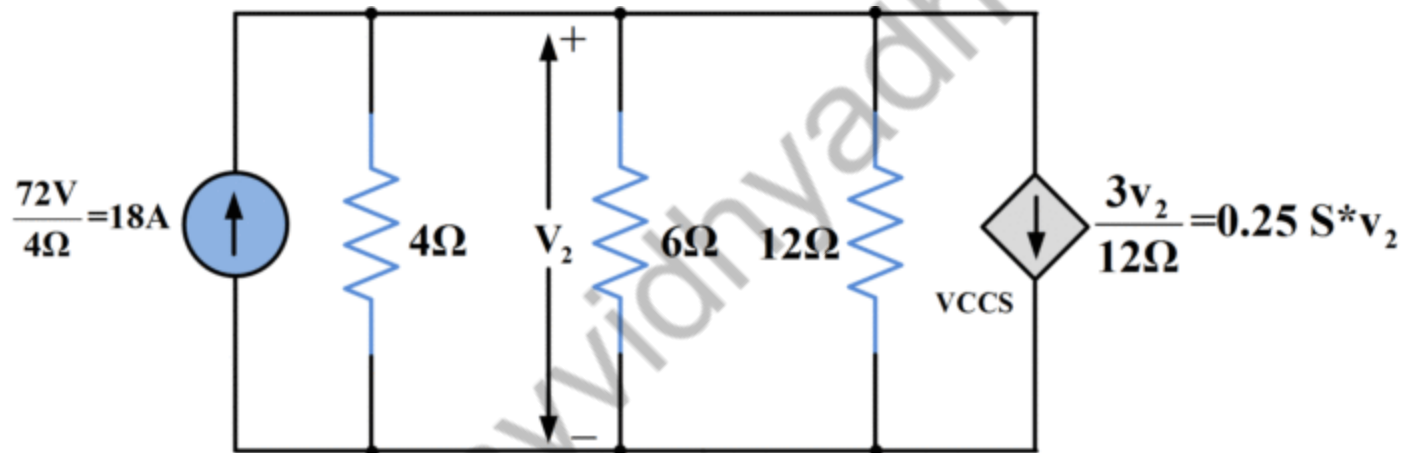

Combining both current sources

Problem 7

Source Transformation Example with Dependent Source

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Source Transformation Example with Dependent Source

$$\frac{72V}{4\Omega} = 18A$$

$$4\Omega$$

$$V_2$$

$$6\Omega \quad 12\Omega$$

$$\frac{3v_2}{12\Omega} = 0.25 \text{ S*}v_2$$

VCCS

$$4\|6\|12 = 2\Omega$$

$$V_2 = 2\,(18 - 0.25v_2)$$

$$V_2 = 36/1.5 = 24V$$

Thank you