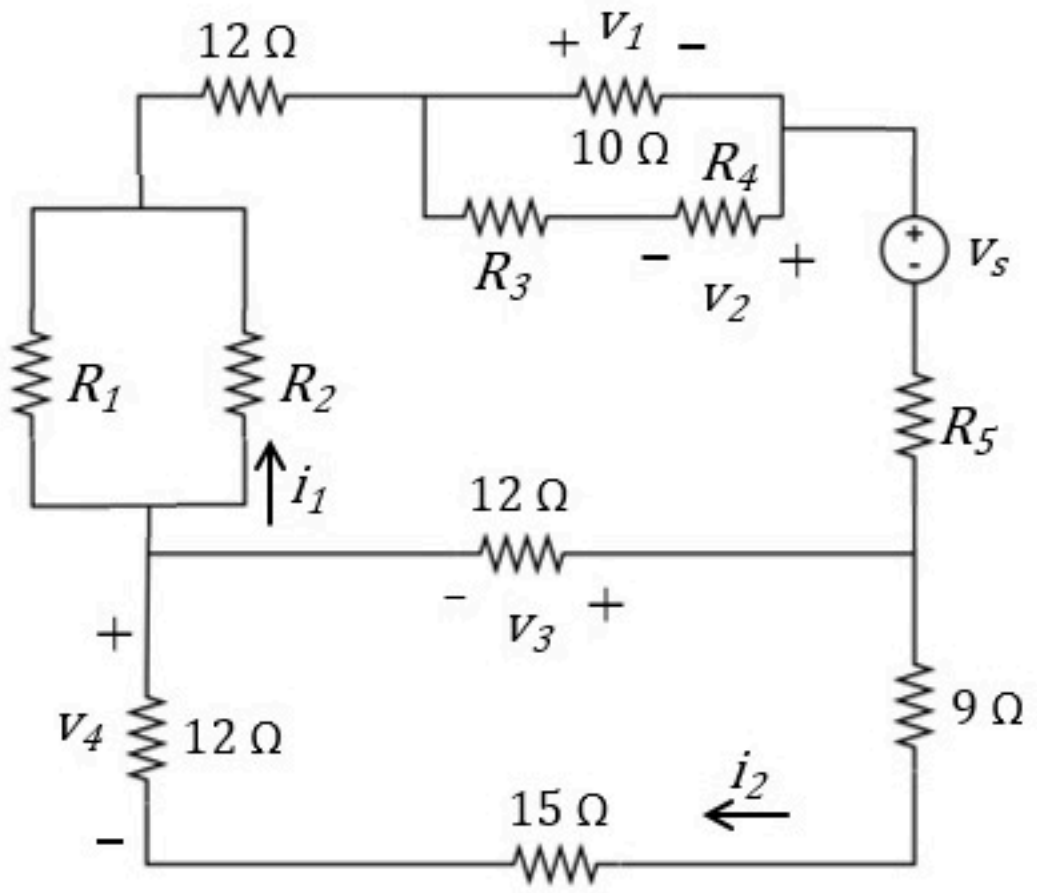
Basic analysis 012

Problem has been graded.

Determine the voltages v_1, v_2, v_3 and v_4 and the currents i_1 and i_2.



Given Variables:

vs : 80 V

R1 : 24 ohm

R2 : 8 ohm

R3 : 6 ohm

R4 : 9 ohm

R5 : 7 ohm

Calculate the following:

v1 (V) :

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v2 (V) :

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v3 (V) :

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v4 (V) :

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i1 (A) :

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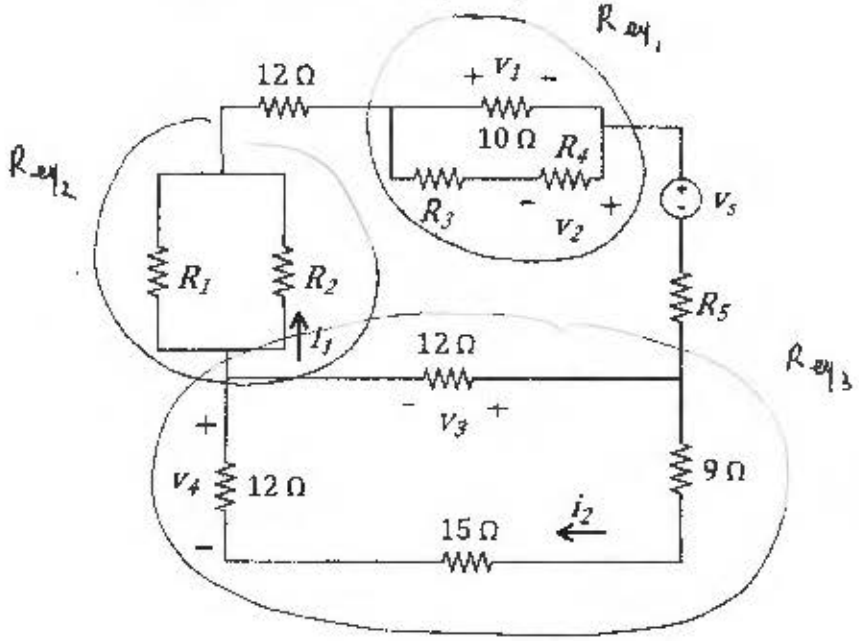
i2 (A) :

Determine the voltages v_1, v_2, v_3 and v_4 and the currents i_1 and i_2.



Vs = 80 V

R1 = 8 Ω

R2 = 24 Ω

R3 = 3 Ω

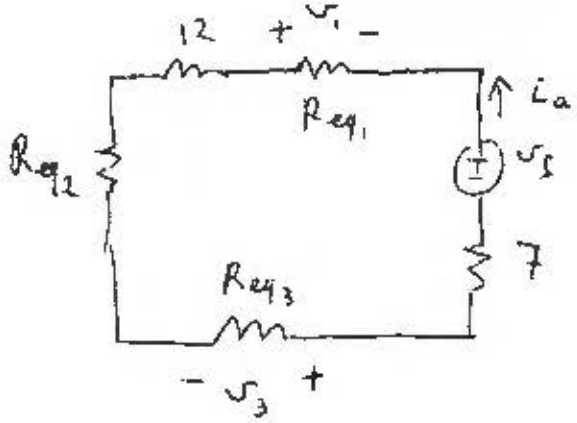
R4 = 12 Ω

R5 = 7 Ω

$$R_{eq_1} = \left(\frac{1}{10} + \frac{1}{3+12}\right)^{-1} = 6\,\Omega$$

$$R_{eq_2} = \left(\frac{1}{8} + \frac{1}{24}\right)^{-1} = 6\,\Omega$$

$$R_{eq_3} = \left(\frac{1}{12} + \frac{1}{12+15+9}\right)^{-1} = 9\,\Omega$$



$$i_a = \frac{v_s}{R_{eq_1} + 12 + R_{eq_2} + R_{eq_3} + 7}$$

$$= \frac{v_s}{40} \quad \Rightarrow \quad i_a = 2\,A$$

$$v_1 = (-i_a)\cdot R_{eq_1} = (-2)\cdot 6 = -12\,V$$

$$\boxed{v_1 = -12\,V}$$

$$v_2 = (-v_1)\cdot \frac{R_4}{R_3+R_4} = 12\cdot \frac{12}{15} = \frac{48}{5}\,V$$

$$\boxed{v_2 = 9.6\,V}$$

$$v_3 = (-i_a)\,R_{eq_3} = (-2)\,9 = -18\,V$$

$$\boxed{v_3 = -18\,V}$$

$$v_4 = (-v_3)\,\frac{12}{12+15+9} = 18\cdot \frac{12}{36} = 6\,V$$

$$\boxed{v_3 = 6\,V}$$

$$i_1 = (-i_a)\,\frac{R_1}{R_1+R_2} = (-2)\,\frac{8}{32} = -0.5\,A$$

$$\boxed{i_1 = -0.5\,A}$$

$$i_2 = (-i_a)\cdot \frac{12}{12+12+15+9} = (-2)\cdot \frac{12}{48} = -0.5\,A$$

$$\boxed{i_2 = -0.5\,A}$$