

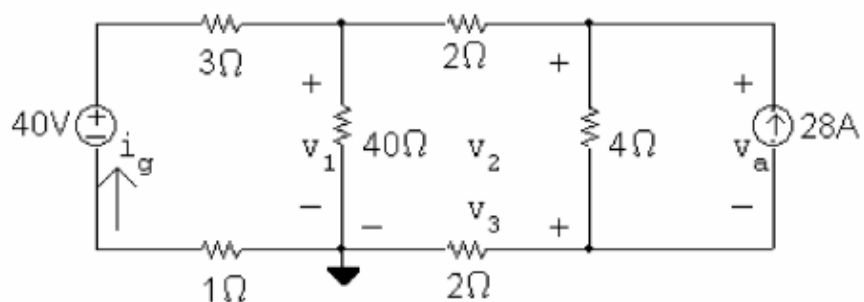
KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
ELECTRICAL ENGINEERING DEPARTMENT
EE-201 ELECTRIC CIRCUITS
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Sec: 9 Quiz # 2 Ser. # Name:

I.D.#

For the circuit shown below, use nodal analysis to find

- a) “ v_1 ”, “ v_2 ”, and “ v_3 ”
- b) the power of the current source (indicating weather it is absorbed or delivered)



Solution:

The three node voltage equations are:

$$\frac{v_1 - 40}{4} + \frac{v_1}{40} + \frac{v_1 - v_2}{2} = 0$$

$$\frac{v_2 - v_1}{2} + \frac{v_2 - v_3}{4} - 28 = 0$$

$$\frac{v_3}{2} + \frac{v_3 - v_2}{4} + 28 = 0$$

Place these equations in standard form:

$$v_1 \left(\frac{1}{4} + \frac{1}{40} + \frac{1}{2} \right) + v_2 \left(-\frac{1}{2} \right) + v_3(0) = \frac{40}{4}$$

$$v_1 \left(-\frac{1}{2} \right) + v_2 \left(\frac{1}{2} + \frac{1}{4} \right) + v_3 \left(-\frac{1}{4} \right) = 28$$

$$v_1(0) + v_2 \left(-\frac{1}{4} \right) + v_3 \left(\frac{1}{2} + \frac{1}{4} \right) = -28$$

Solving, $v_1 = 60 \text{ V}$; $v_2 = 73 \text{ V}$; $v_3 = -13 \text{ V}$.

$$p_{28A} = -v_a(28 \text{ A}) = -(v_2 - v_3)(28 \text{ A}) = -(73 + 13)(28) = -2408 \text{ W}$$

The 28 A source delivers 2408 W.