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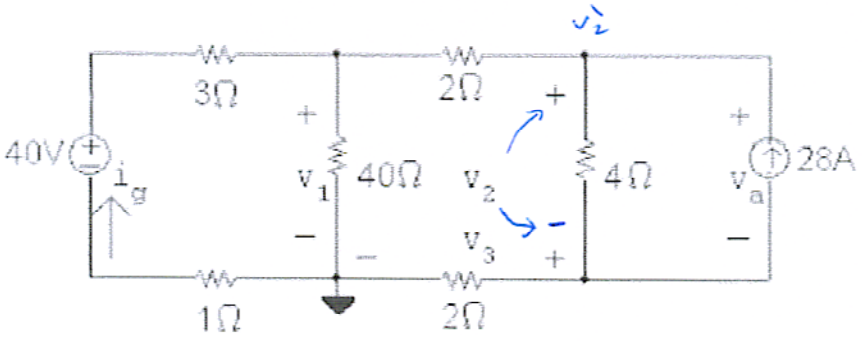
Sec: 9 **Quiz # 2** **Ser. #** **Name:** **I.D.#**

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, $v_1 = 60$ V; $v_2 = 73$ V; $v_3 = -13$ V. $\therefore V_2 = V_2 - V_3 = 86$ 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.