

Name: _____ (please print)

Signature: _____

ECE 2300 – Quiz #4
October 16, 2012

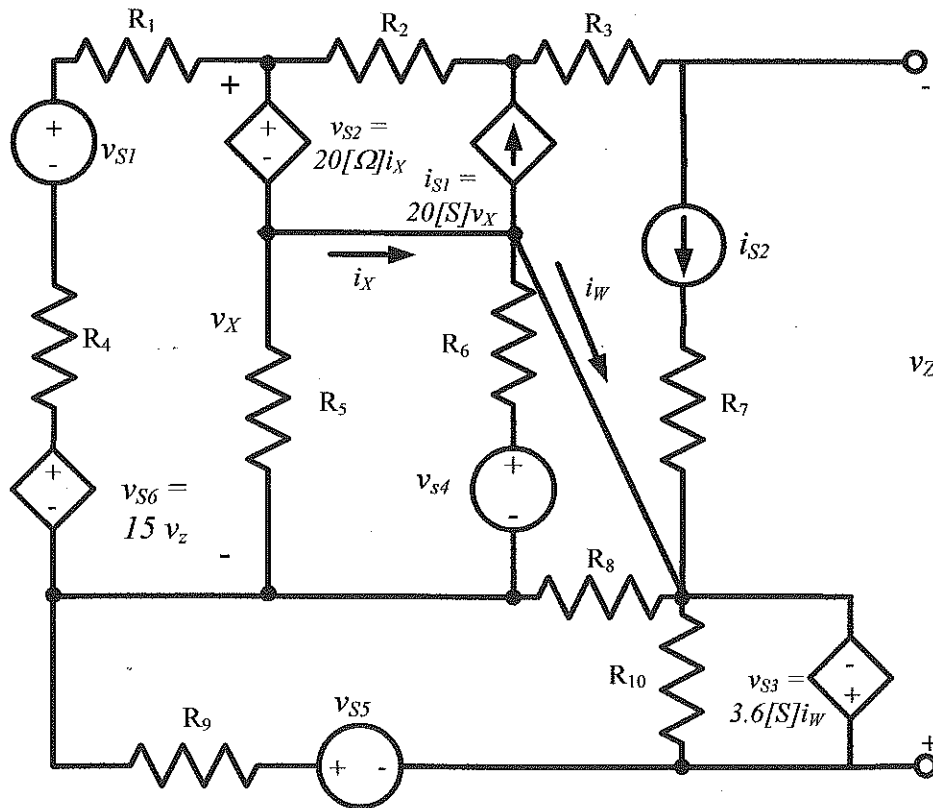
**Keep this quiz closed and
face up until you are told to
begin.**

1. This quiz is closed book, closed notes. You may use one 8.5" x 11" crib sheet, or its equivalent.
2. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit.
3. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
4. Do not use red ink. Do not use red pencil.
5. You will have 30 minutes to work on this quiz.

_____ /20

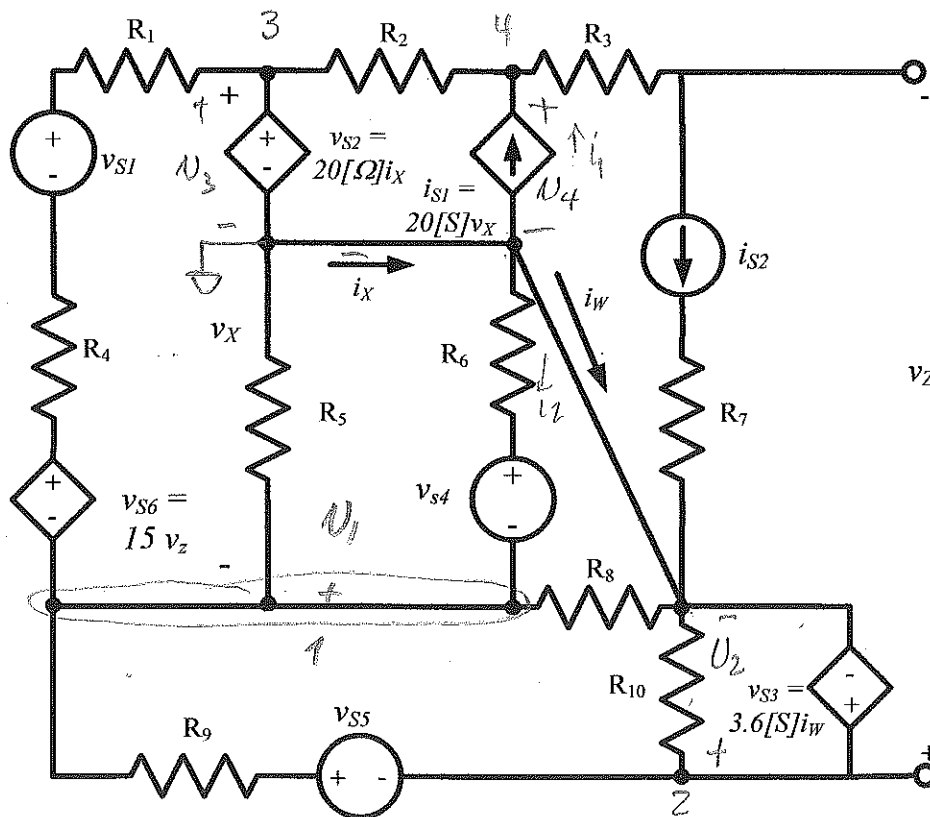
Write a complete set of equations that could be used to solve the circuit shown below using **either** the mesh current method **or** the node voltage method. Do not simplify the circuit. Do not try to solve the equations. Significant credit will be deducted if the proper node voltage or mesh current notation is not used.

Use only one method: you cannot get extra credit for writing equations for both methods.



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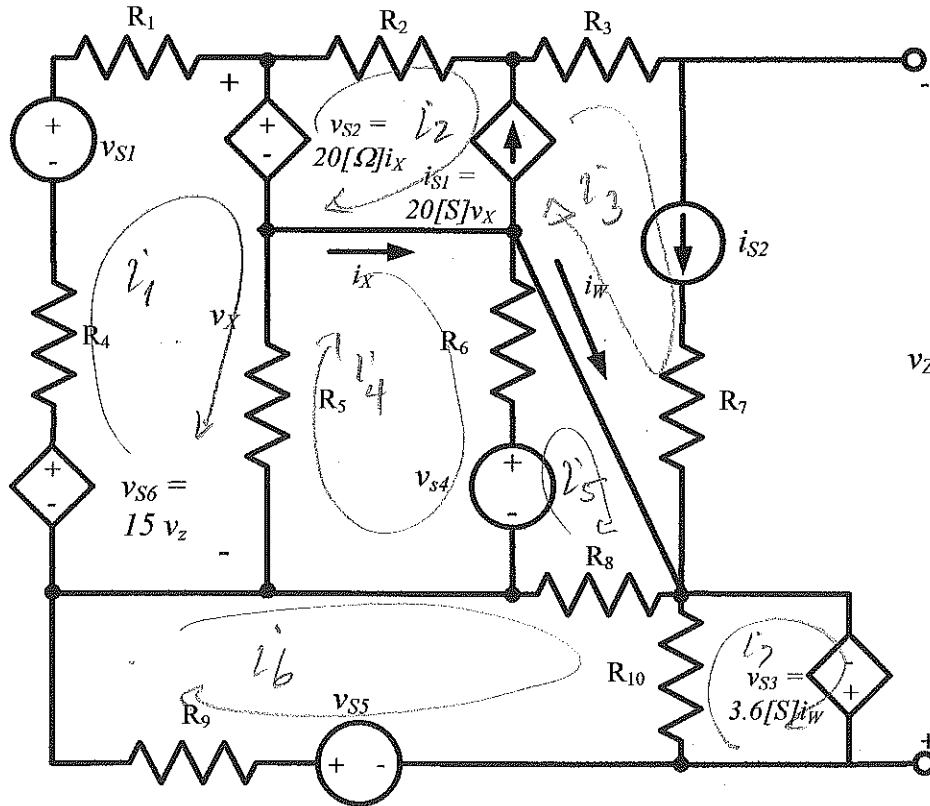
NODE VOLTAGE EQNS: (MESH CURRENT DONE SEPARATELY)

$$\begin{aligned}
 \begin{array}{l} +4 \\ 1: \end{array} & \frac{v_1}{R_5} + \frac{v_1 + v_{S4}}{R_6} + \frac{v_1 - v_3 + v_{S5} + 15v_2}{R_1 + R_4} + \frac{v_1}{R_8} + \frac{v_1 - v_2 - v_{S5}}{R_9} = 0 \\
 \begin{array}{l} +1 \\ 2: \end{array} & v_2 = 3.6 i_w \\
 \begin{array}{l} +1 \\ 3: \end{array} & v_3 = 20 i_x \\
 \begin{array}{l} +2 \\ 4: \end{array} & -20 v_x + i_{S2} + \frac{v_4 - v_3}{R_2} = 0 \\
 \begin{array}{l} +3 \\ i_x: \end{array} & -i_x + i_w + 20 v_x - \frac{v_1 + v_{S4}}{R_6} = 0
 \end{aligned}$$

$$\begin{aligned}
 v_x: & v_x = v_3 - v_1 \\
 i_w: & -i_w - i_{S2} - \frac{v_1}{R_8} - \frac{v_1 - v_2 - v_{S5}}{R_9} = 0 \\
 v_2: & v_3 + v_2 - v_4 + i_{S2} R_3 = 0
 \end{aligned}$$

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MESH CURRENT EQNS: (NODE VOLTAGE DONE SEPARATELY)

$$\textcircled{1} \quad -15V_Z + i_1 R_4 - v_{S6} + i_1 R_1 + 20i_X + (i_1 - i_4)R_5 = 0 \quad +3$$

$$\textcircled{2}, \textcircled{3} \quad i_3 = i_{S2} \quad +1 \quad i_3 - i_2 = 20V_X \quad +1$$

$$\textcircled{4} \quad (i_4 - i_5)R_6 + v_{S4} + (i_4 - i_1)R_5 = 0 \quad +2$$

$$\textcircled{5} \quad (i_5 - i_4)R_6 + (i_5 - i_6)R_8 - v_{S4} = 0 \quad +2$$

$$\textcircled{6} \quad (i_6 - i_5)R_8 + (i_6 - i_7)R_{10} - v_{S5} + i_6 R_9 = 0 \quad +3$$

$$\textcircled{7} \quad -3.6i_W + (i_7 - i_6)R_{10} = 0 \quad +2$$

$$\text{a) } v_X: v_X = 20i_X + R_5(i_1 - i_4) \quad +2$$

$$\text{b) } i_X: i_X = i_4 - i_2 \quad +1$$

$$\text{c) } i_W: i_W = i_5 - i_3 \quad +1$$

$$\text{d) } v_Z: \quad +3$$

$$v_Z + (i_7 - i_6)R_{10} - 20i_X + i_2 R_2$$

$$+ i_2 R_3 = 0$$