

Name: _____ (please print)

Signature: _____

ECE 2300 – Quiz #3
March 18, 2013

**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 on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. It is assumed that your work will begin on the same page as the problem statement. If you choose to begin your work on another page, you must indicate this on the page with the problem statement, with a clear indication of where the work can be found. **If your work continues on to another page, indicate clearly where your work can be found. Failure to indicate this clearly will result in a loss of credit.**
4. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
5. Do not use red ink. Do not use red pencil.
6. You will have 30 minutes to work on this quiz.

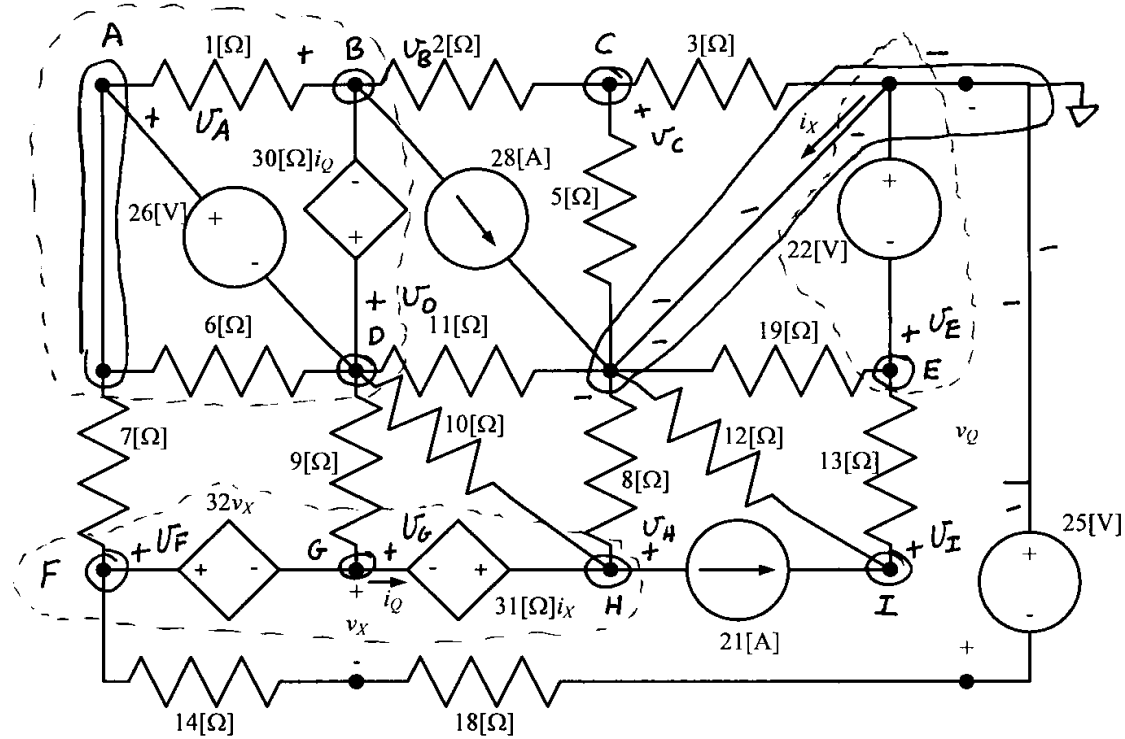
_____/20

Room for extra work

Room for extra work

ECE 2300 -- Quiz #3 -- March 18, 2013 -- Solution

Use the node-voltage method to write a complete set of equations that could be used to solve this circuit. Do not simplify the circuit. Do not attempt to solve or simplify your equations. Define all variables.



We begin by naming the nodes and defining node-voltages. We need $9+3=12$ equations.

$$\textcircled{A+B+D} \quad \frac{U_B - U_C}{2[\Omega]} + 28[\text{A}] + \frac{U_D}{11[\Omega]} + \frac{U_D - U_H}{10[\Omega]} + \frac{U_D - U_G}{9[\Omega]} + \frac{U_A - U_F}{7[\Omega]} = 0$$

$$\textcircled{A+B+D} \quad U_A - U_D = 26[\text{V}]$$

$$\textcircled{A+B+D} \quad U_D - U_B = 30[\Omega] i_Q$$

$$\textcircled{C} \quad \frac{U_C - U_B}{2[\Omega]} + \frac{U_C}{3[\Omega]} + \frac{U_C}{5[\Omega]} = 0$$

See next page

Room for extra work

$$\textcircled{E} \quad V_E = -22 \text{ [V]}$$

$$\textcircled{F+G+H} \quad \frac{V_F - V_A}{7 \text{ [}\Omega\text{]}} + \frac{V_G - V_D}{9 \text{ [}\Omega\text{]}} + \frac{V_H - V_D}{10 \text{ [}\Omega\text{]}} + \frac{V_H}{8 \text{ [}\Omega\text{]}} + 21 \text{ [A]} + \frac{V_F + 25 \text{ [V]}}{(14+18) \text{ [}\Omega\text{]}} = 0$$

$$\textcircled{F+G+H} \quad V_F - V_G = 32 V_X$$

$$\textcircled{F+G+H} \quad V_H - V_G = 31 \text{ [}\Omega\text{]} i_X$$

$$\textcircled{I} \quad -21 \text{ [A]} + \frac{V_I}{12 \text{ [}\Omega\text{]}} + \frac{V_I - V_E}{13 \text{ [}\Omega\text{]}} = 0$$

$$\textcircled{L_X} \quad i_X - \frac{V_C}{3 \text{ [}\Omega\text{]}} - \frac{(V_F + 25 \text{ [V]})}{(14+18) \text{ [}\Omega\text{]}} + \frac{V_E - V_I}{13 \text{ [}\Omega\text{]}} + \frac{V_E}{19 \text{ [}\Omega\text{]}} = 0$$

$$\textcircled{L_Q} \quad -i_Q + \frac{V_H - V_D}{10 \text{ [}\Omega\text{]}} + \frac{V_H}{8 \text{ [}\Omega\text{]}} + 21 \text{ [A]} = 0$$

$$\textcircled{V_X} \quad V_X + \frac{(-25 \text{ [V]} - V_F) 14 \text{ [}\Omega\text{]}}{(14+18) \text{ [}\Omega\text{]}} + 32 V_X = 0$$

12 equations, 12 unknowns.

We can solve.