

Name: _____ (please print)

Signature: _____

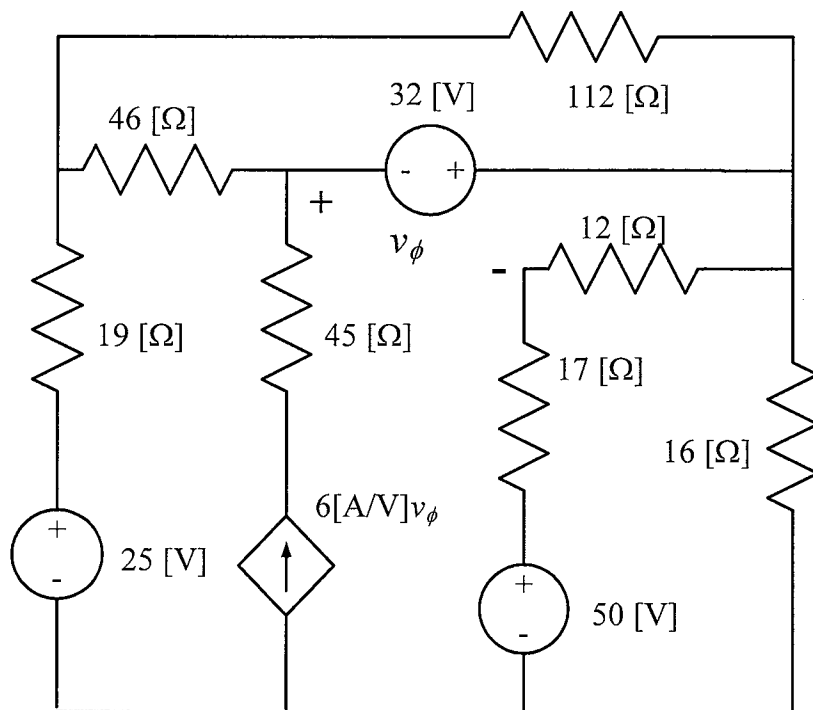
ECE 2300 – Quiz #3
June 29, 2016

**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. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
4. If the grader has difficulty following your work because it is messy or disorganized, you will lose credit.
5. Do not use red ink. Do not use red pencil.
6. You will have 35 minutes to work on this quiz.

_____/40

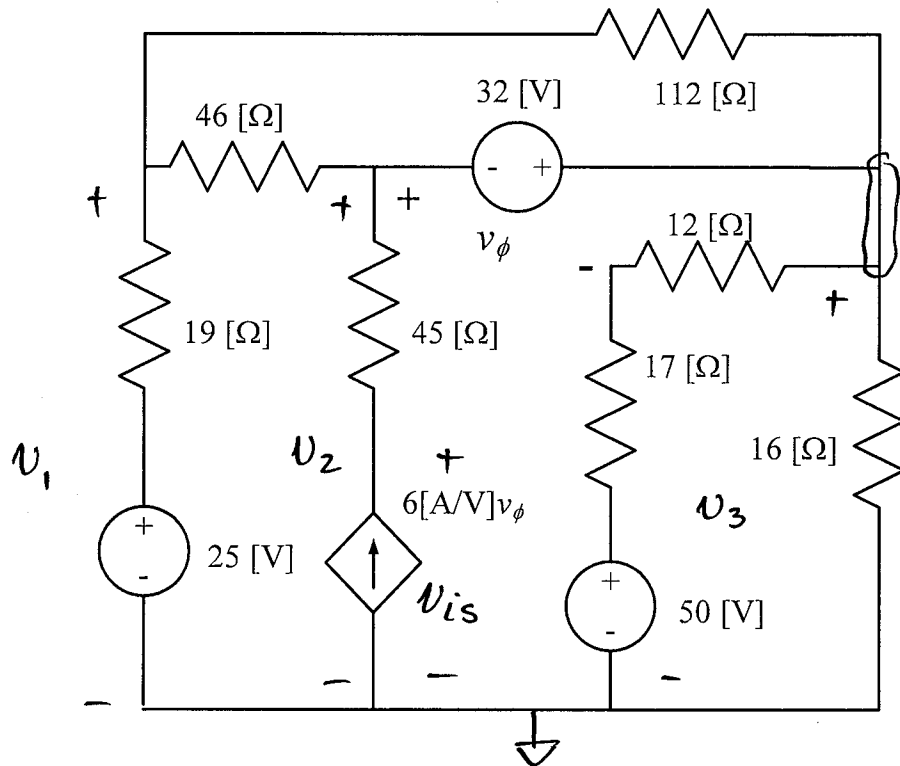
The circuit below is a proposed design for the new and improved Trombettamax T-QX19. In order to meet specifications, the dependent current source must deliver a certain amount of power. Calculate the power delivered by the dependent current source.



Room for extra work

Room for extra work

The circuit below is a proposed design for the new and improved Trombettamax T-QX19. In order to meet specifications, the dependent current source must deliver a certain amount of power. Calculate the power delivered by the dependent current source, and state whether it is delivered or absorbed.



We will need the voltage v_{ic} . We'll use both node voltage and mesh current method, but of course only one is required.

NVM: ① $\frac{v_1 - 25}{19} + \frac{v_1 - v_3}{112} + \frac{v_1 - v_2}{46} = 0$

② + ③ $\frac{v_2 - v_1}{46} - 6v_\phi + \frac{v_3 - v_1}{112} + \frac{v_3 - 50}{29} + \frac{v_3}{16} = 0$

$$v_3 - v_2 = 32$$

$$-v_\phi + v_2 - v_3 + \frac{v_3 - 50}{29} \cdot 12 = 0$$

✓

Room for extra work

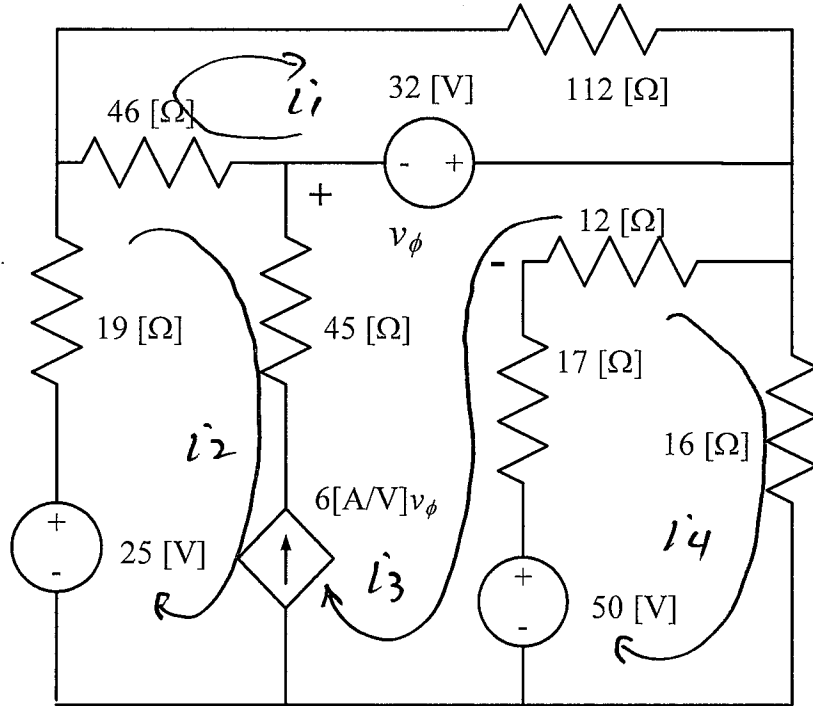
$$V_1 = 56.217 \text{ [V]} \quad V_2 = 100.47 \text{ [V]}$$

$$V_3 = 132.48 \text{ [V]} \quad V_\phi = 2.128 \text{ [V]}$$

$$V_{is} = V_2 + 6V_\phi \cdot 45 = 675.03 \text{ [V]}$$

$$\underline{P_{del \text{ by } 6V_\phi}} = V_{is} \cdot 6V_\phi = \underline{8.619 \text{ [kW]}}$$

The circuit below is a proposed design for the new and improved Trombettamax T-QX19. In order to meet specifications, the dependent current source must deliver a certain amount of power. Calculate the power delivered by the dependent current source, and state whether it is delivered or absorbed.



MCM:

$$\textcircled{1} \quad 112 i_1 + 32 + 46 (i_1 - i_2) = 0$$

$$\textcircled{2} + \textcircled{3} \quad 46 (i_2 - i_1) - 32 + 29 (i_3 - i_4) + 50 - 25 + 19 i_2 = 0$$

$$i_3 - i_2 = 6 v_\phi$$

$$\textcircled{4} \quad 16 i_4 - 50 + 29 (i_4 - i_3) = 0$$

$$v_\phi = -32 + 12 (i_3 - i_4)$$

Room for extra work

$$i_1' = -0.6809 \text{ [A]}$$

$$i_2' = -1.6430 \text{ [A]}$$

$$i_3' = 11.124 \text{ [A]}$$

$$i_4' = 8.280 \text{ [A]}$$

$$V_\phi = 2.120 \text{ [V]}$$

$$\begin{aligned} V_{is} &= 45(6V_\phi) - 32 + 29(i_3' - i_4') + 50 \\ &= 672.88 \text{ [V]} \end{aligned}$$

$$P_{del \text{ by } 6V_\phi} = 6 \cdot V_\phi \cdot V_{is} = 8.559 \text{ [kW]}$$

This is not exactly the answer we got using NUM but we will assume this is due to round-off error.