

Name: _____ (please print)

Signature: _____

ECE 2300 – Quiz #4
July 9, 2015

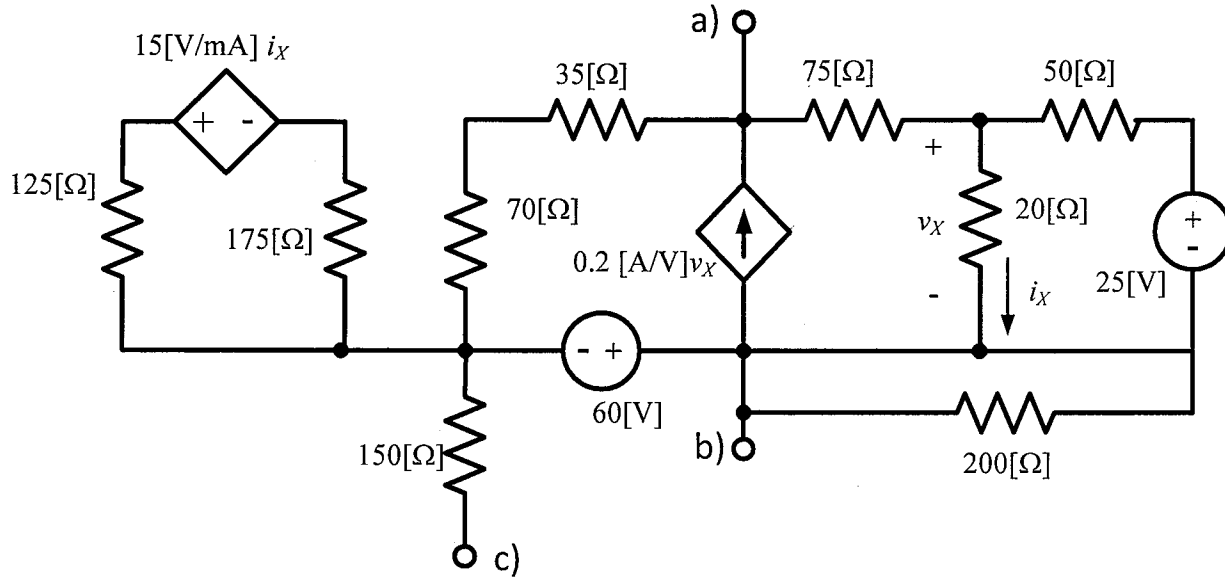
**Keep this quiz closed and
face up until you are told to
begin.**

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 30 minutes to work on this quiz.

_____/25

Room for extra work

- i) For the circuit below, find the Thevenin Equivalent with respect to terminals a), b). Draw the Thevenin Equivalent circuit, and carefully label the parameters.
- ii) If a 10[V] voltage source is connected to terminals a), b), with the positive side of the voltage source connected at a), how much power is delivered by the source?



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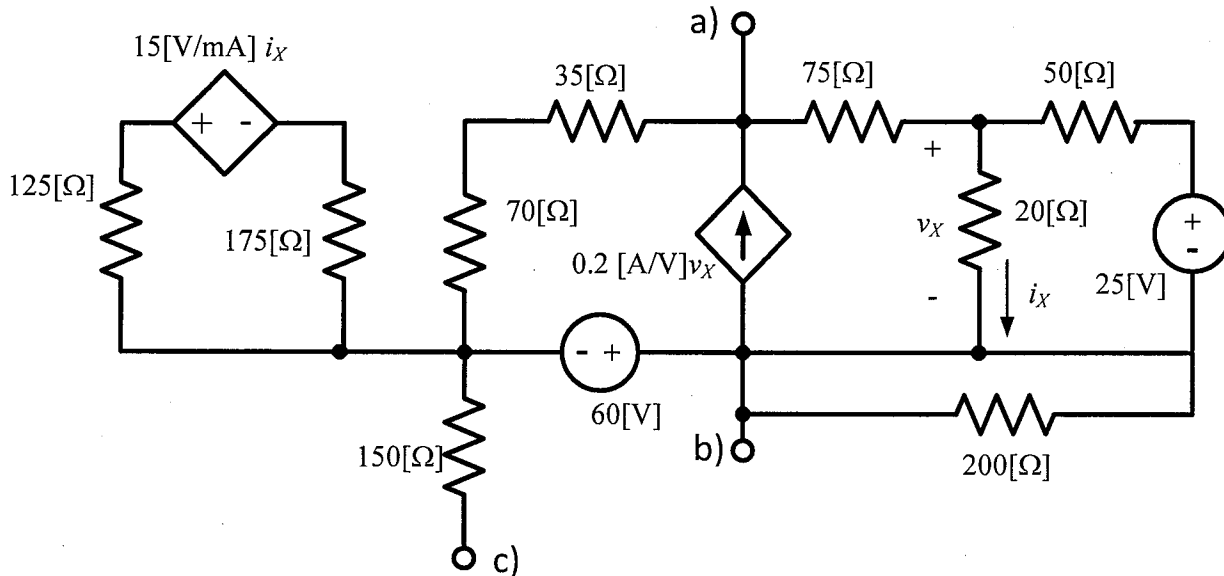
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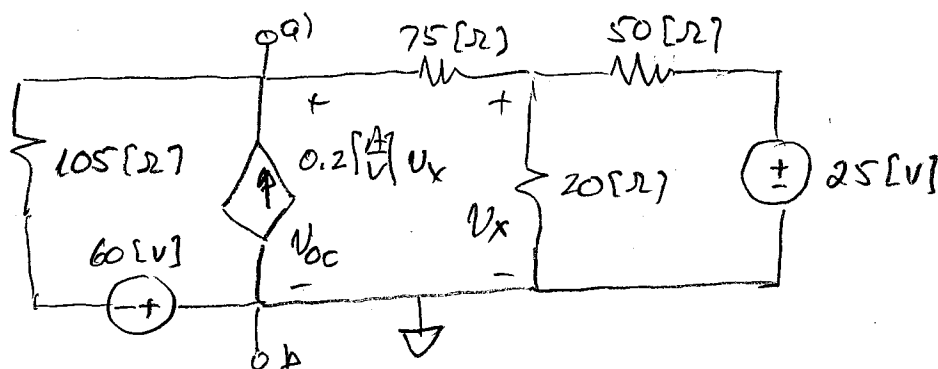


i)

We need two of i) open-circuit voltage, ii) short circuit current, and iii) Thevenin resistance via test source. We will do all three here.

OPEN-CIRCUIT VOLTAGE

We re-draw with unnecessary parts removed...



$$\frac{V_{oc} + 60}{105} - 0.2 V_x + \frac{V_{oc} - V_x}{75} = 0$$

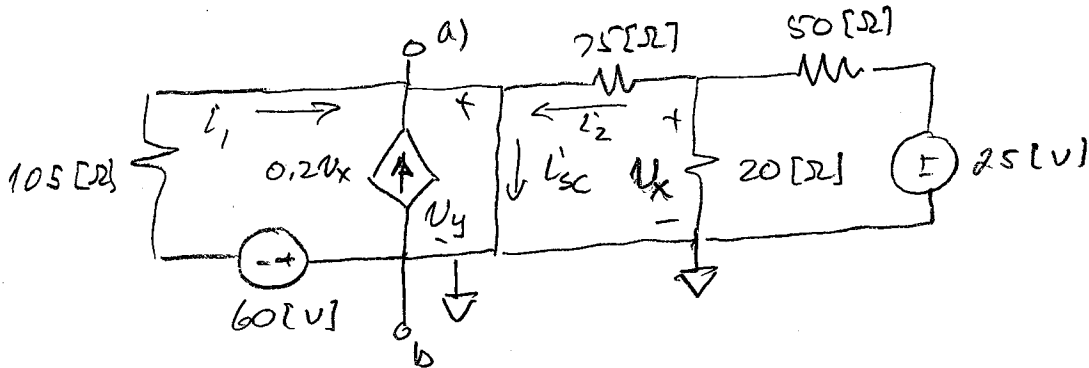
$$V_{oc} = V_{TH} = -62.84 \text{ [V]}$$

$$\frac{V_x}{20} + \frac{V_x - V_{oc}}{75} + \frac{V_x - 25}{50} = 0$$

$$V_x = -4.105 \text{ [V]}$$

Room for extra work

SHORT CIRCUIT CURRENT



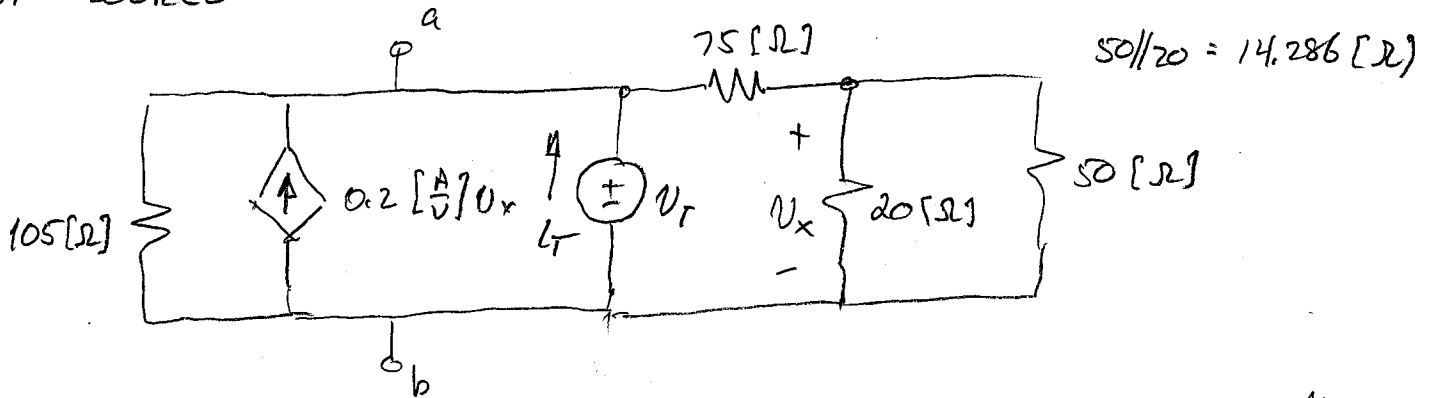
$$V_y = 0 \quad \frac{V_x}{20} + \frac{V_x - 0}{75} + \frac{V_x - 25}{50} = 0 \Rightarrow V_x = 6.0 \text{ [V]}$$

$$I_1' = \frac{-60}{105} = -0.5714 \text{ [A]} \quad I_2' = \frac{V_x}{75} = 0.08 \text{ [A]}$$

$$I_{sc}' = I_1' + I_2' + 0.2 V_x = 0.7086 \text{ [A]}$$

$$\Rightarrow R_{TH} = \frac{V_{oc}}{I_{sc}} = \underline{\underline{-88.68 \text{ [}\Omega\text{]}}}$$

TEST SOURCE



$$V_x = V_T \cdot \frac{14.286}{14.286 + 75} = 0.16 V_T \quad V_T = -0.2 (0.16) V_T + \frac{V_T}{14.286 + 75} + \frac{V_T}{105}$$

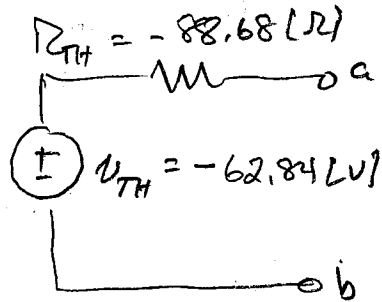
$$I_T' = V_T (-0.01128)$$

$$\Rightarrow R_{TH} = \frac{V_T}{I_T'} = \underline{\underline{-88.68 \text{ [}\Omega\text{]}}}$$

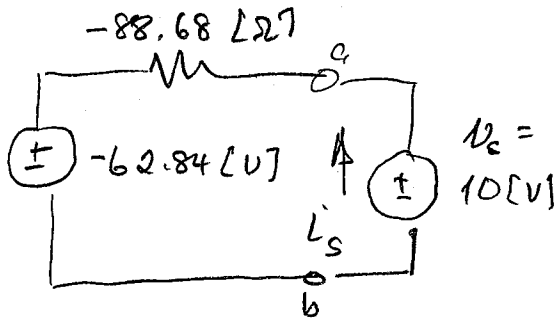
PG. 2

Room for extra work

So we have



ii)



$$I_s' = \frac{10 - (-62.84)}{-88.68} = -0.8214 [A]$$

$$P_{del by 10[V]} = I_s' \cdot V_s = -8.214 [W]$$
