Sirindhorn International Institute of Technology

Thammasat University at Rangsit

School of Information, Computer and Communication Technology

ECS 203: Problem Set 6

Semester/Year: **2/2014**
Course Title: Basic Electrical Engineering
Instructor: Asst. Prof. Dr. Prapun Suksompong (prapun@siit.tu.ac.th)
Course Web Site: http://www2.siit.tu.ac.th/prapun/ecs203/

Due date: Feb 27, 5 PM

Instructions

1. Solve all problems. (5 pt)
2. ONE sub-question will be graded (5 pt). Of course, you do not know which part will be selected; so you should work carefully on all of them.
3. Late submission will be heavily penalized.
4. ***Write down all the steps*** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.

Questions

1) [Alexander and Sadiku, 2009, Q4.33] Determine R_{Th} and V_{Th} at terminals 1-2 of each of the circuits of Figure 1.

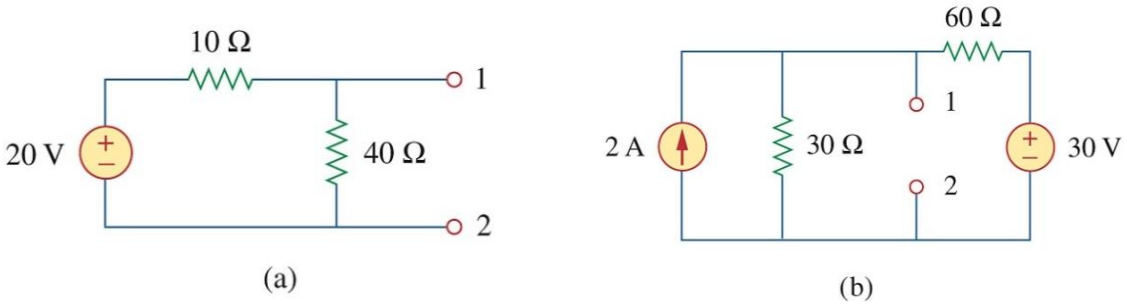

Figure 1

2) [Alexander and Sadiku, 2009, Q4.39] Obtain the Thevenin equivalent at terminals a-b of the circuit in Figure 2.

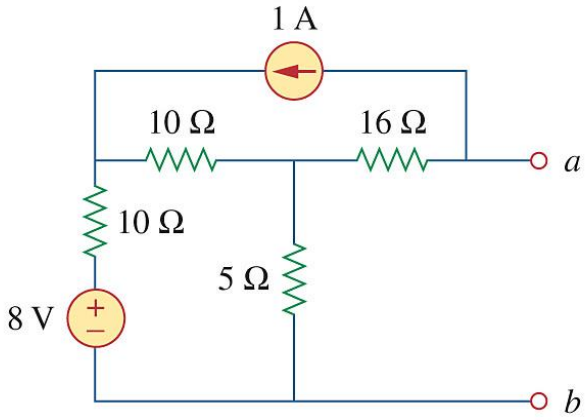

Figure 2

3) [Alexander and Sadiku, 2009, Q4.45] Find the Norton equivalent of the circuit in Figure 3.

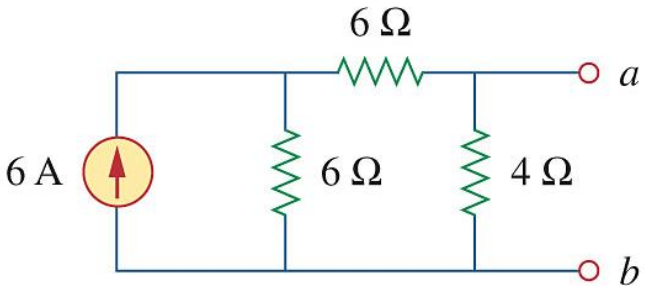

Figure 3

4) [Alexander and Sadiku, 2009, Q4.56] Use Norton's theorem to find V_o in the circuit of Figure 4.

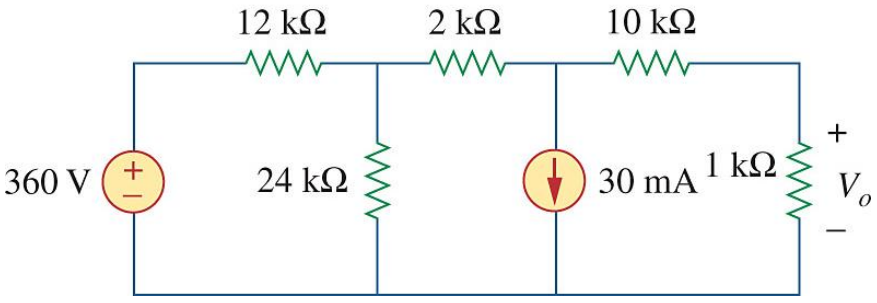

Figure 4

5) [ECS203, Midterm Exam, 2009-2, Q1] In this question, you **must** use the specified techniques to solve the problem. There will be **no credit** given if you do not follow the instructions. As always, your score depends strongly on your explanation of your answer. If the explanation is incomplete, zero score may be given even when the final answer is correct.

Let

$$V_S = 6 \text{ V and } R_1 = R_2 = R_3 = 2\ \Omega.$$

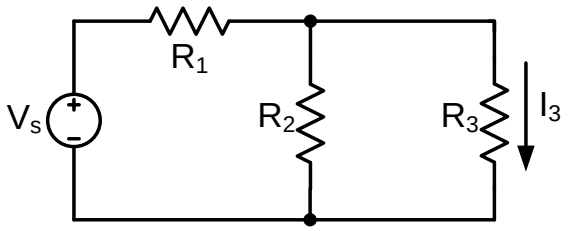

Figure 5

Use the above values for all parts of this question.

a. Consider the circuit in Figure 5. Find I_3 by first applying **source transformation** once and then use any method of your choice to find I_3.
b. Use **nodal analysis** to obtain V_a in Figure 6. Then, use V_a and the resistance value(s) to **find** I_3.

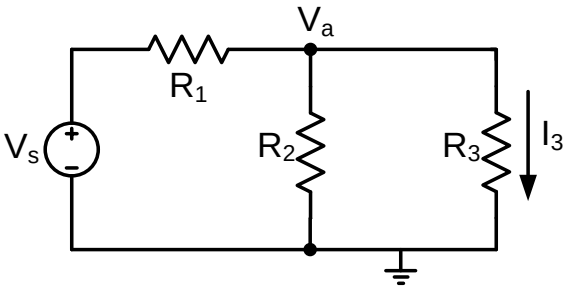

Figure 6

c. Use **mesh analysis** to **find all** mesh currents in Figure 7. Then, use the mesh current(s) to **find** I_3.

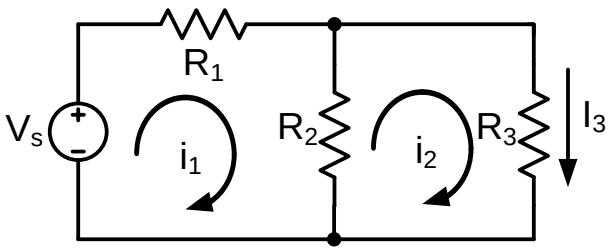

Figure 7

d. In this part, we will find the **Norton equivalent** of the circuit (with respect to terminals a and b) in Figure 8

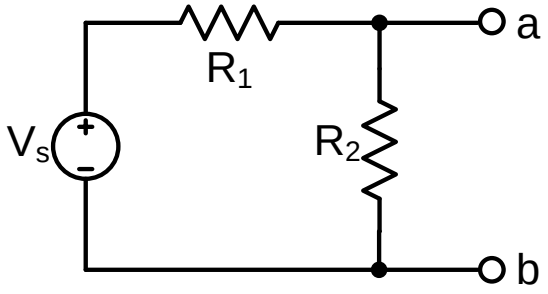

Figure 8

i. Draw the circuit that is used to find I_N and then find I_N.
ii. Draw the circuit that is used to find R_N from Figure 8 and then find R_N.
iii. Draw the **Norton equivalent** of the circuit in Figure 8.

e. Use your answers from part (d) to determine I_3 in Figure 5.