# Homework 2

Due date:
Mar.19th, 2018
Turn in your homework in class

Rules:
- Work on your own. Discussion is permissible, but extremely similar submissions will be judged as plagiarism.
- Please show all intermediate steps: a correct solution without an explanation will get zero credit.
- Please submit on time. No late submission will be accepted.
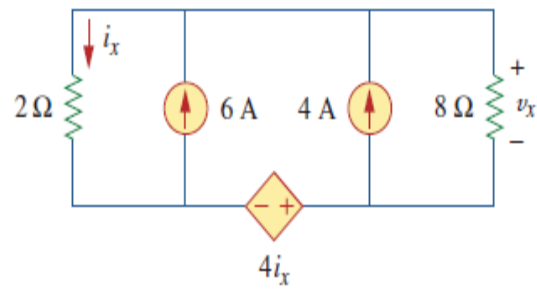- Please prepare your submission in English only. No Chinese submission will be accepted.

1.Determine the number of independent loops, branches and nodes.
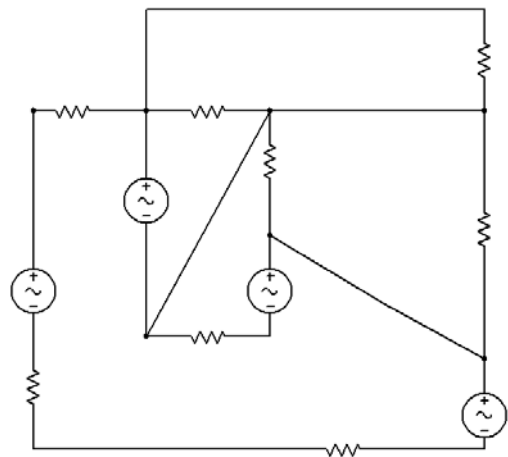
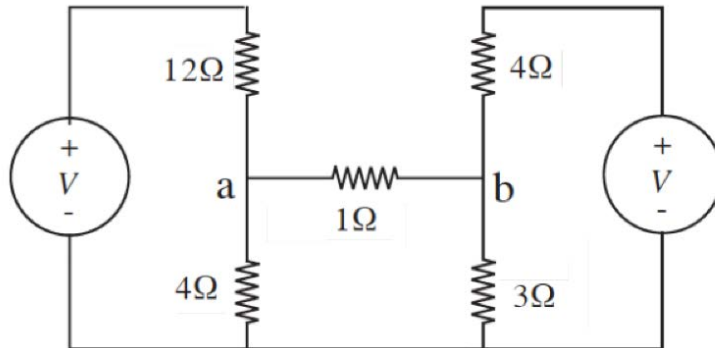2. Using source transformation, find the value of i_x in the circuit.
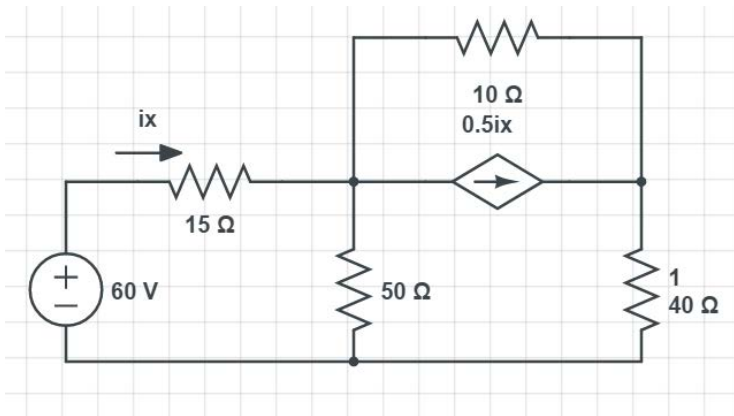
3. Using superposition, find the value of v_x.

4. Use Thévenin method to find the voltage and current between two nodes a and b, Vab and Iab.

(Hint: Find the Thevenin equivalent circuit between node a and b, excluding the 1 ohm resistance. Afterwards, find Vab.)

5. Try to find the Thevenin's and Norton's equivalent circuits of these following figures.

(1) Find the Norton and Thevenin equivalent with respect to the terminals a-b in the circuit **only with independent source**.(Hint: you can use source transformation to simplify the procedure.)
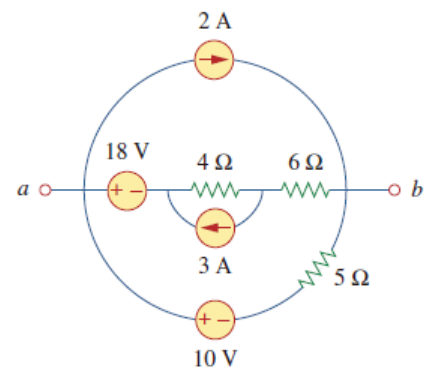
(2) Find the Norton and Thevenin equivalent in the circuit with respect to the terminals a-b **with dependent and independent source.**
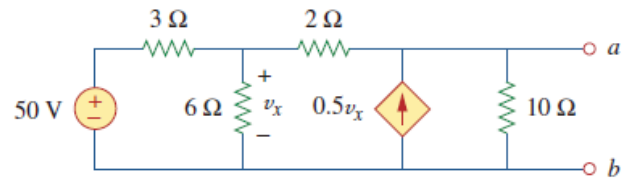
(3) Find the Norton equivalent circuit in the figure **only with dependent source**.
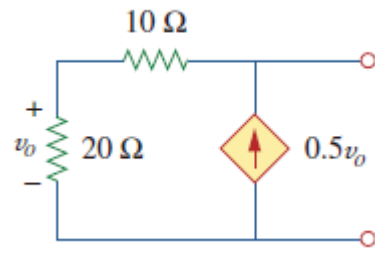
6. In practice, Thevenin or Norton equivalent are used to make complicated circuit clearer. For the circuit in the figure, find the Thevenin equivalent between terminals a and b.
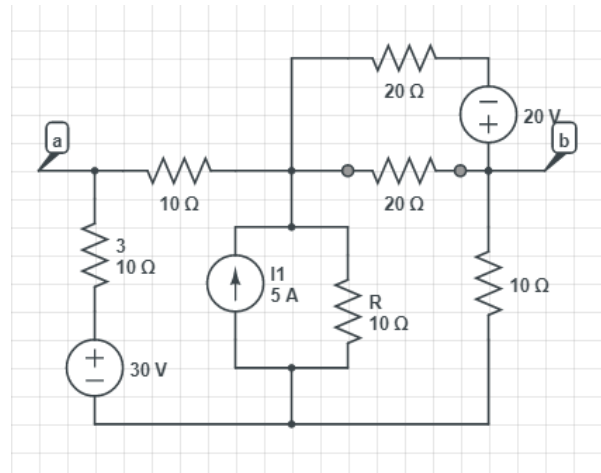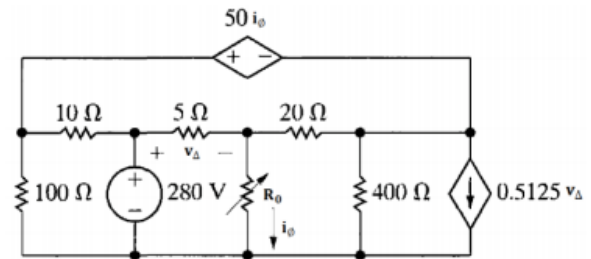
7. The variable resistor in the circuit in the figure below is adjusted for maximum power transfer to R_0.

(1) Find the numerical value of R_0.

(2) Find the maximum power delivered to R_0.

(3) How much power does the 280V source deliver to the circuit when R_0 is adjusted to the value found in (1)?

8. Xiaoming Wang, an SPST student, did an experiment on an electric circuit as shown in figure (a). He wanted to find the relationship between output voltage and output current. He found that the relationship is linear as shown in figure (b). To further find out the relationship among parameters inside the circuit, he would like to ask his SIST friends for help. So as an SIST student, please use all circuit theorems to help him.

    The circuit shown in Figure has four unspecified circuit parameters : v_s, R_1, R_2 and d, ($R_1 = R_2 = R$) where d is the gain of the dependent current source. ***Solve R and Vs as the function of d*** so that the output voltage and current has the the V-I characteristics shown in Figure (b).

(Hint: You can solve the problem by understanding the meaning of slope and v-intercept in the figure. Use what you have learnt before. You will know how the linearity the circuit works.)

(a)

(b)