Homework 2

Due data: Mar.14^{th}

Turn in your homework in class

Rules:

- Please 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

[14 points]The circuit are shown in **Fig.1.a** and **Fig.1.b**.
(a). Find the equivalent resistance R_{ab} between node a and node b in the circuit shown in **Fig.1.a**.
(b). Find the power extracted from the current controlled current source in the circuit shown in **Fig.1.b**.

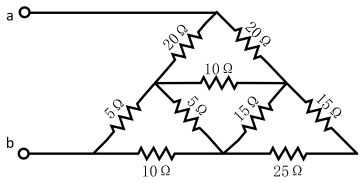

Figure 1: a

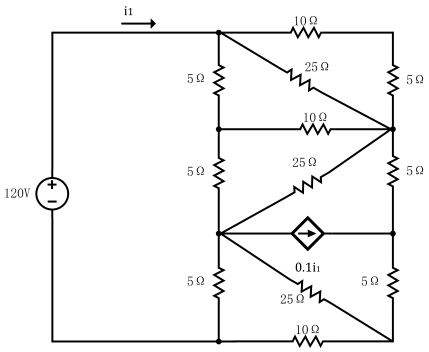

Figure 1: b

2

[15 points]The circuit is shown in **Fig.2**.
(a). Use superposition theorem to find V_0.
(b). Find the Thevenin equivalent circuit of the part framed by the dotted line, with terminals a and b.
(c). Find the power absorbed by the voltage controlled current source.

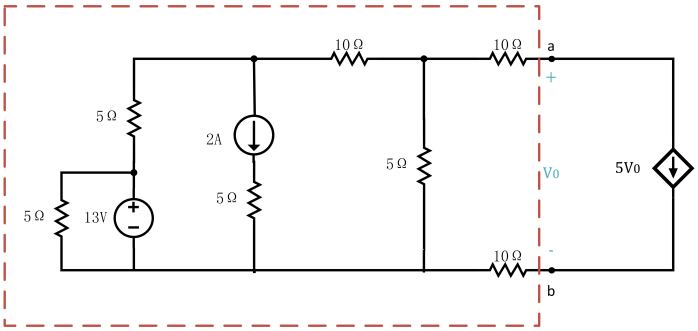

Figure 2:

3

[14 points]The circuit is shown in **Fig.3**. Find the Thevenin and Norton equivalent circuit at terminals a and b.

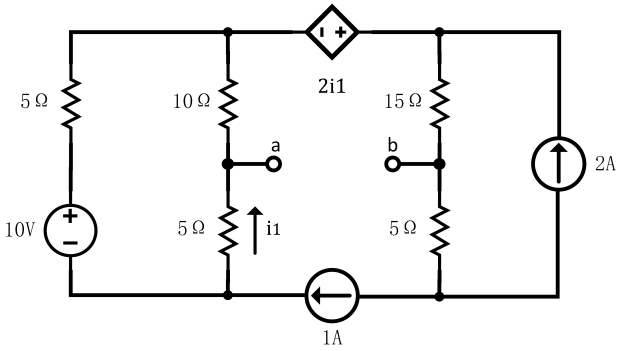

Figure 3:

4

[14 points]The circuit is shown in **Fig.4**. With varying resistant R, find the maximal power delivered to the resistant R. (Hint: you can use the Thevenin's theorem.)

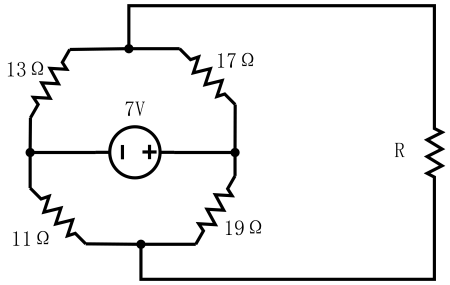

Figure 4:

5

[14 points]The circuit is shown in **Fig.5**. $V_{cc} = 6V$. Assume the Op Amps are ideal, and OA_1 operates in its linear region.

(a). Find the expression of v_{O1} in terms of R1,R2,R3,R4,V1. When $\frac{R_3}{R_1} = \frac{R_4}{R_2}$, determine the value of v_{O1}.

(b). Assume $v_2 = v_3 = 2V$, $\frac{R_8}{R_5} = \frac{R_7}{R_6} = 2$. Find the value v_{O2}.

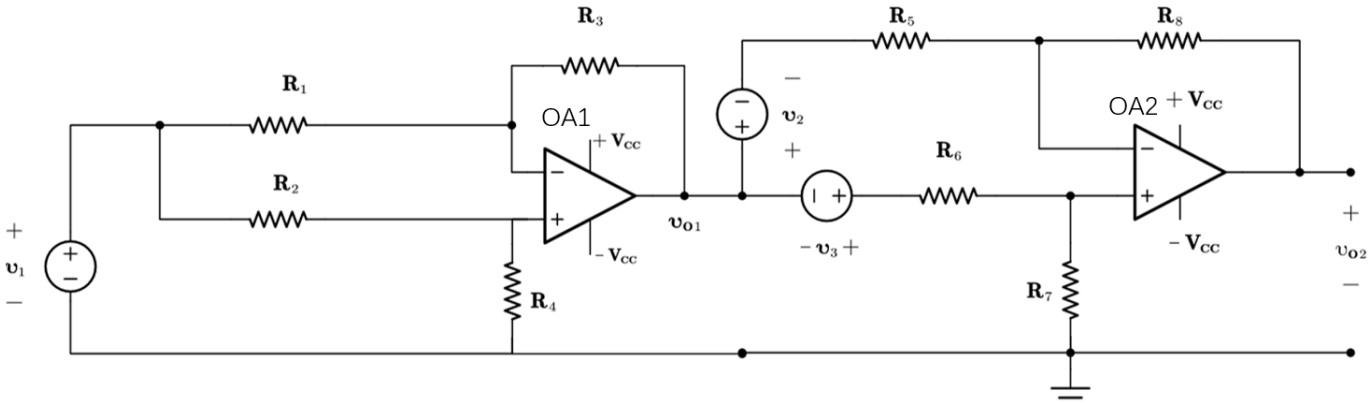

Figure 5:

6

[14 points]The circuit is shown in **Fig.6**. The constitution of the operation amplifier is the circuit in blue (one can observe that the OA is not ideal). $A_{vo} = 100$ and $R_i = R_S$, $R_L = R_O$. $+Vcc = 10V$ and $-Vcc = -10V$ are the positive and negative power supply of the op amp.

(a). Find the v_0 for $v_s = 0.3V$

(b). Find the v_0 for $v_s = 0.5V$

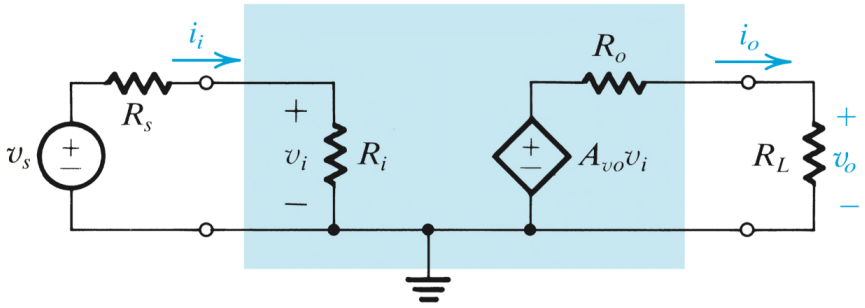

Figure 6:

7

[15 points]The circuit is shown in **Fig.7**. The operational amplifier is ideal and operates in its linear region. Find the output voltage v_o. (Hint: You can first find the Thevenin equivalent circuit of the part framed by the dotted line, with terminals a and b.)

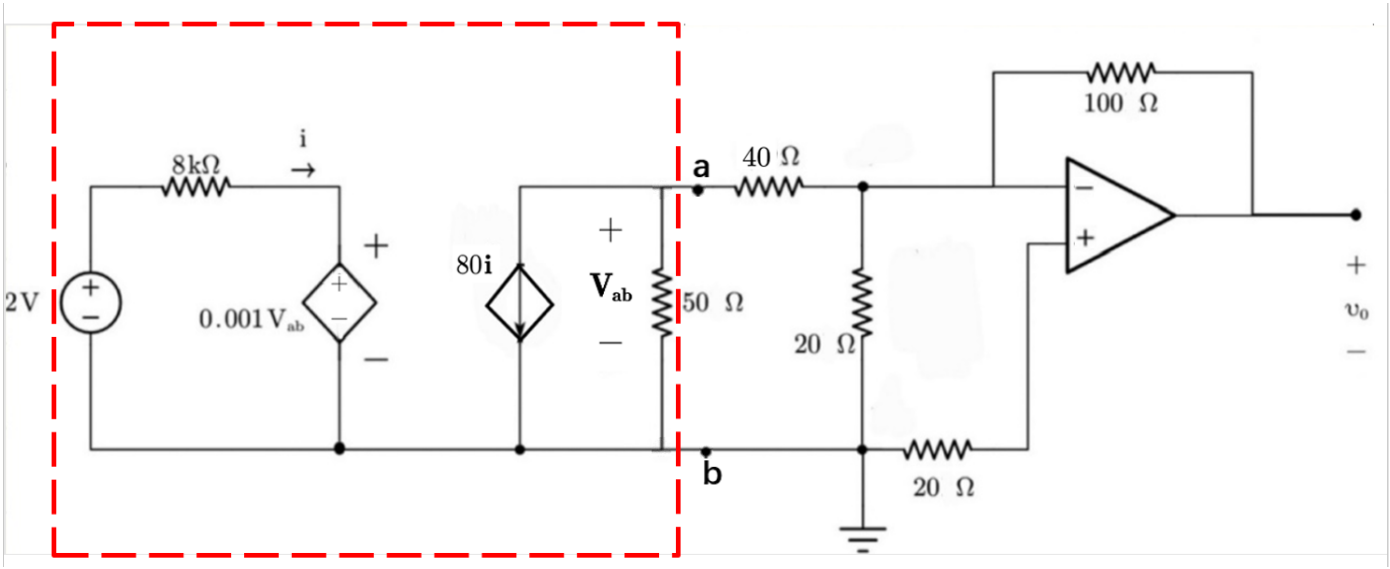

Figure 7: