电路学NO.1小考 NO.123

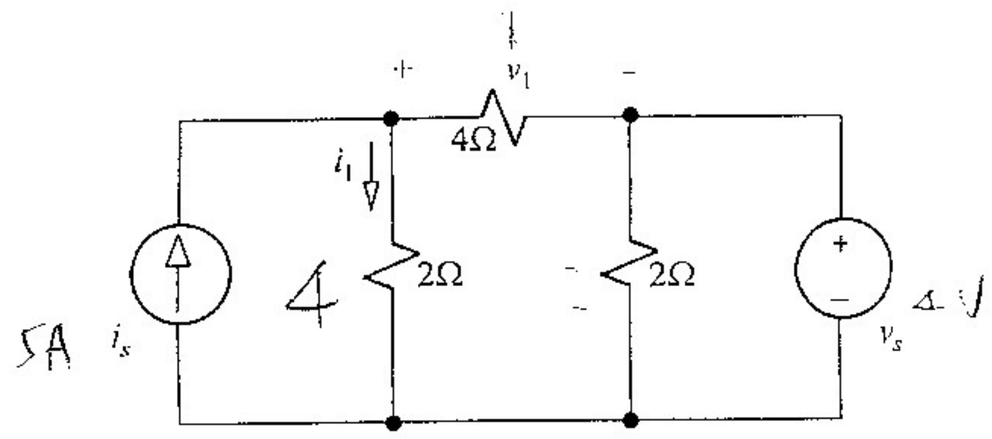


Figure 1: A circuit.

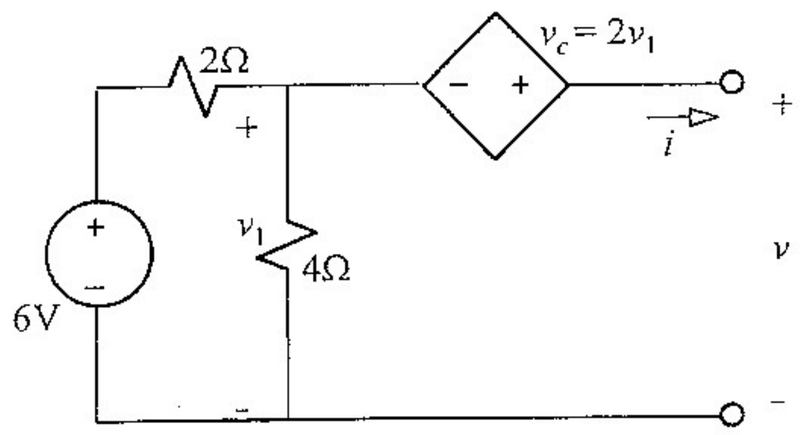


Figure 2: A source network

1. (20%) Consider the circuit shown in Figure 1.

   (a) (5%) Let $i_s = 5(\text{A})$ and $v_s = 0(\text{V})$. Find the values of i_1 and v_1.

   (b) (5%) Let $i_s = 0(\text{A})$ and $v_s = 4(\text{V})$. Find the values of i_1 and v_1.

   (c) (10%) Let $i_s = 5(\text{A})$ and $v_s = 4(\text{V})$. Find the values of i_1 and v_1.

2. (35%) Consider the source network shown in Figure 2.

   (a) (5%) What is the open-circuit voltage v_{oc}, i.e., the value v when $i = 0$?

   (b) (5%) What is the short-circuit current i_{sc}, i.e., the value i when $v = 0$?

   (c) (5%) Please draw the $v - i$ characteristic curve of the source network.

   (d) (5%) Please find the Thévenin resistance R_t of the source network.

   (e) (5%) Please draw the Thévenin equivalent circuit of the source network.

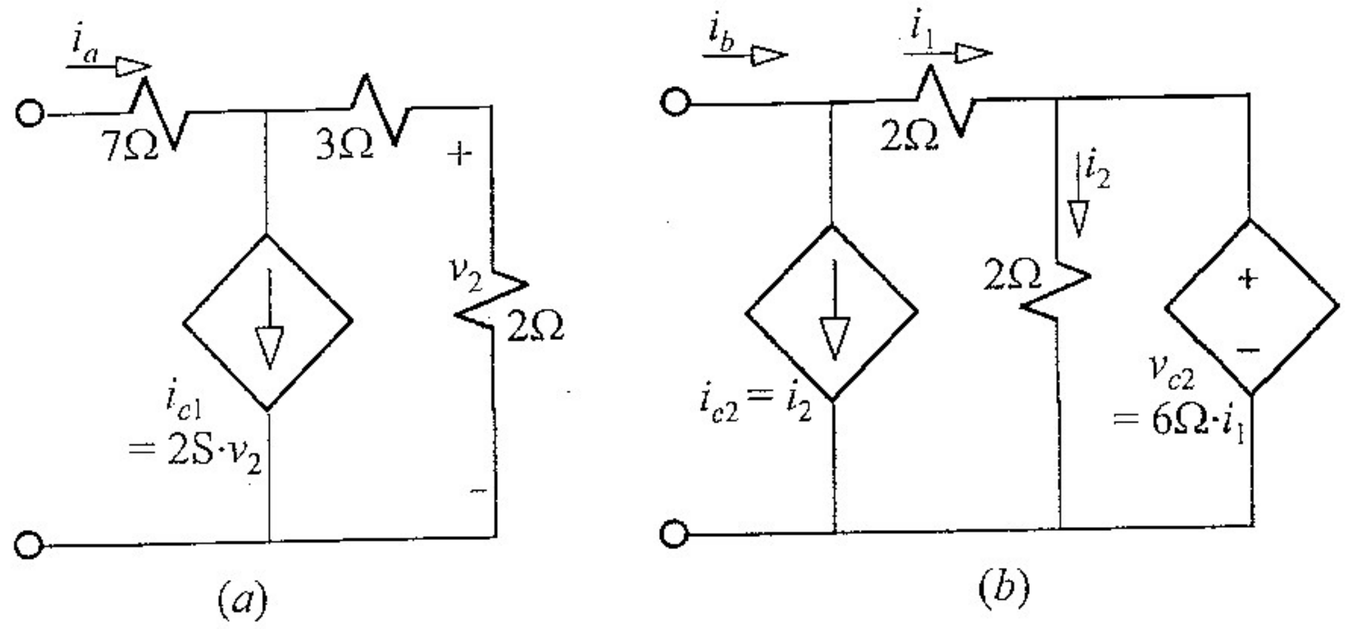
   (f) (5%) Please draw the Norton equivalent circuit of the source network.

   (g) (5%) When the source network is connected to a load resistance of 4Ω, what is the current that flows through the load resistance?

3. (30%) Consider two load networks shown in Figure 3.

   (a) (5%) Find the equivalent resistance $R_{eq,a}$ for the load network (a).

   (b) (10%) Find the equivalent resistance $R_{eq,b}$ for the load network (b).



(a) (b)

Figure 3: Two load networks

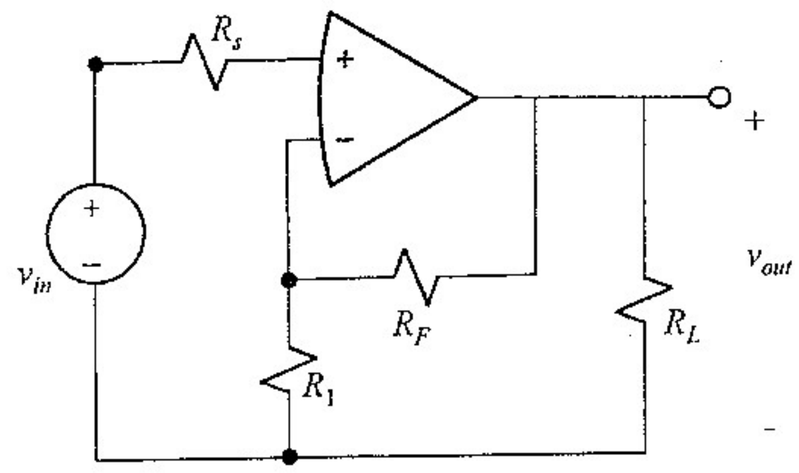


Figure 4: An Op-Amp Circuit.

(c) (5%) When the source network in Figure 2 is connected to load network (a), find the current i_a and the voltage v_2.

(d) (5%) When the source network in Figure 2 is connected to load network (b), find the currents i_b and i_2.

(e) (5%) In questions (c) and (d), if the 6V voltage source in Figure 2 is replaced with a 12V voltage source, what are the values of v_2 and i_2, respectively?

4. (15%) The circuit shown in Figure 4 is a voltage amplifier. Assume the Op-Amp in the figure is ideal. Please express v_{out} in terms of v_{in} and other resistance values.