

ee101_thevenin_1.sqproj

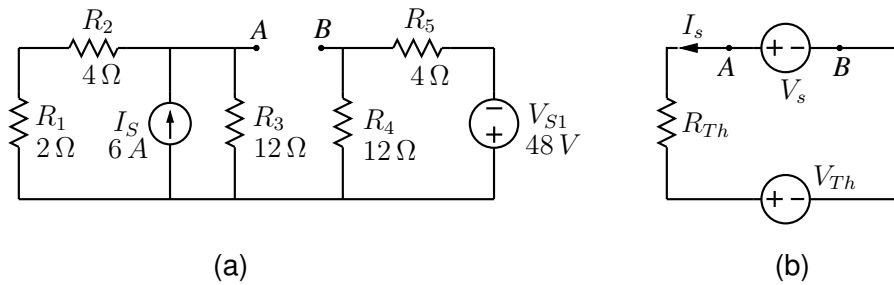


Figure 1: (a) Circuit example, (b) Thevenin equivalent circuit with a voltage source connected between A and B .

For the circuit shown in Fig. 1 (a), we want to compute the Thevenin equivalent circuit as seen from the port AB . How do we verify with simulation whether our Thevenin equivalent circuit is correct? We can use the following approach.

We connect a voltage source between nodes A and B (see Fig. 1 (b)). Then V_s and I_s follow the relationship,

$$V_s = V_{Th} + I_s R_{Th}. \quad (1)$$

In other words, if V_s is plotted as a function of I_s , we expect to obtain a straight line with a y -intercept equal to V_{Th} and an x -intercept equal to V_{Th}/R_{Th} . From this information, we can obtain V_{Th} and R_{Th} .

Exercise Set

1. Find V_{Th} and R_{Th} for the circuit shown in Fig. 1 (a) as seen from port AB .
2. Simulate the circuit shown in Fig. 1 (a) with a voltage source connected between A and B . Plot V_s versus I_s and obtain V_{Th} , R_{Th} from the graph. Compare with the result you obtained analytically in (1).

Note that the ground element is used in the circuit file merely to set a reference for the node voltages (as required by the simulator); it is not relevant to the Thevenin equivalent calculation.

3. Replace the voltage source between A and B with a resistor $R = 5\ \Omega$. What is the expected value of current through R ? Simulate the circuit and verify your answer.