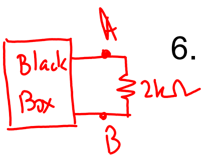
Assignment 02

1. Suppose a voltage source has an ideal voltage of 5V and an internal resistance of 1Ω. For what values of the lead resistance will the voltage source appear stiff?
2. Suppose a current source has an ideal current of 100 mA and an internal resistance of 50 MΩ. For what values of load resistance will the current source appear stiff?
3. The internal resistance of a voltage source equals 0.1Ω. How much voltage is dropped across this internal resistance when the current through it equals 5 A?
4. If the ideal current of a current source is 5 mA and the internal resistance is 250 kΩ, determine the load current flowing through the load resistor 10 kΩ. Is this a stiff current source?
5. Design a hypothetical current source using a battery and a resistor. The current source must meet the following specifications: It must supply a stiff 1 mA of current to any load resistance between 0 and 10 kΩ.



6. Somebody hands you a black box with a 2 kΩ resistor connected across the exposed load terminal. How can you measure the Thevenin voltage? Now suppose the black box has a knob on it that allows you to reduce all internal voltage and current sources to zero. How can you measure the Thevenin resistance?

A & B Terminals

i) Remove 2kΩ

ii) $V_{OC,AB} = V_{Th}$.

iii) $R_{Th} = R_{AB}$ when 2kΩ is removed

7. Determine the Thevenin voltage and Thevenin resistance of the given circuit in Fig. 1. What would happen when the voltage source is decreased to 12 V? Calculate the load current for the load resistance of 1 kΩ.

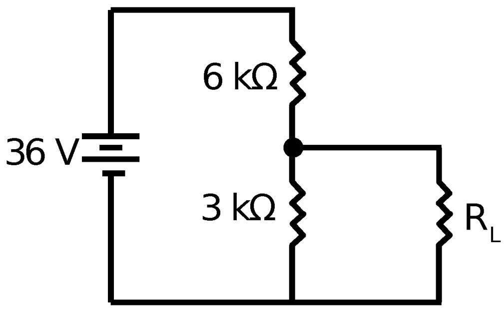


Fig. 1

Fig. 2

8. How do you analyze the circuit of Fig. 1 using Norton's theorem?
9. Calculate the load current in Fig. 2 for each of the load resistance: 1 kΩ, 3 kΩ, 4 kΩ, 5 kΩ, 6 kΩ.

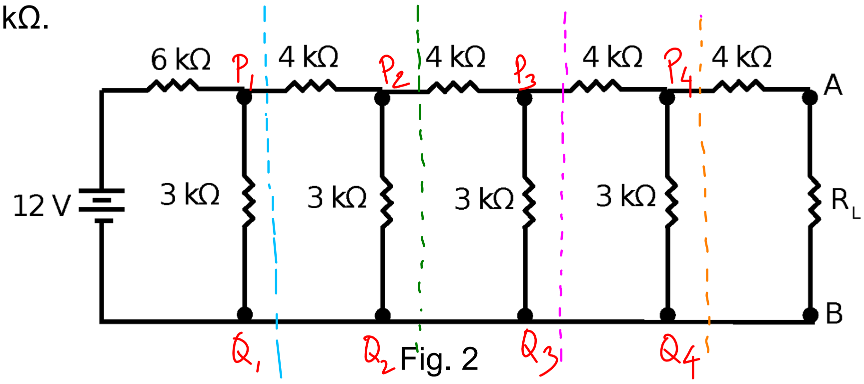
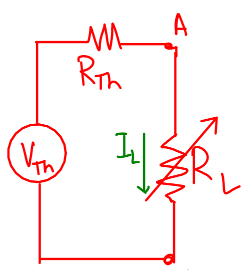


Fig. 2



$\equiv$

$I_L = \frac{V_{Th}}{R_{Th}+R_L}$

10. What resistor draws a current of 5 A when connected across the terminals *a* and *b* of the circuit shown in Fig. 3.

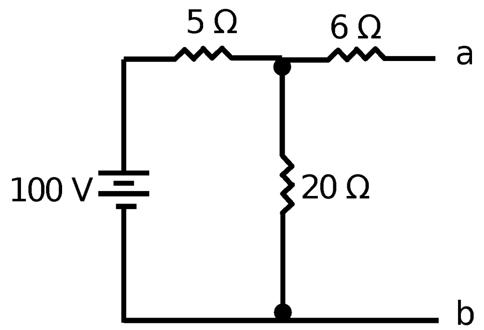


Fig. 3

11. Find the Thevenin equivalent of the circuit shown in Fig. 4.

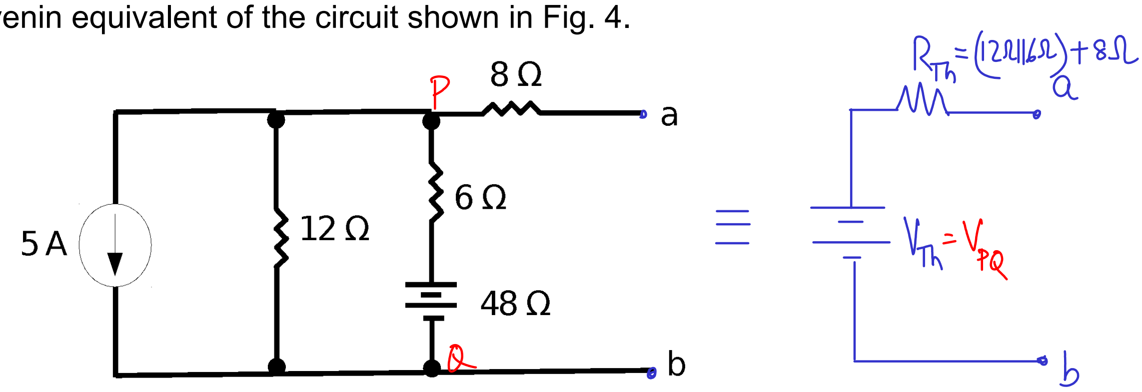
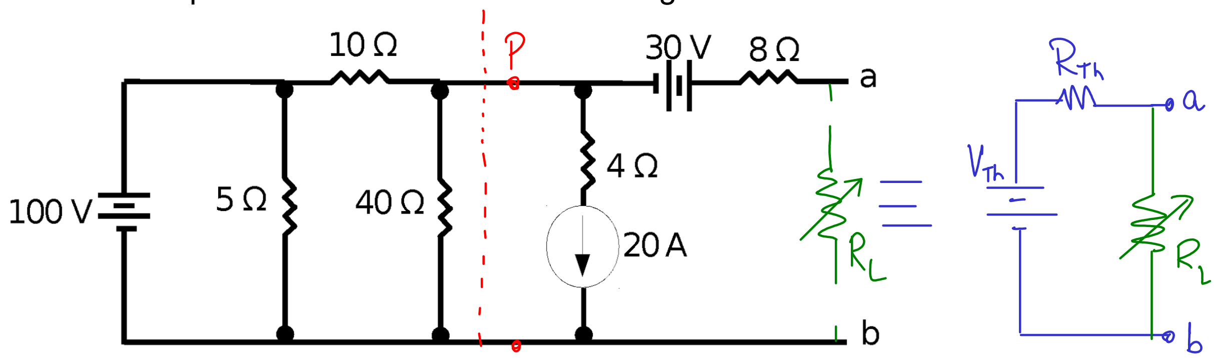


Fig. 4

12. Find the Thevenin equivalent of the circuit shown in Fig.5.

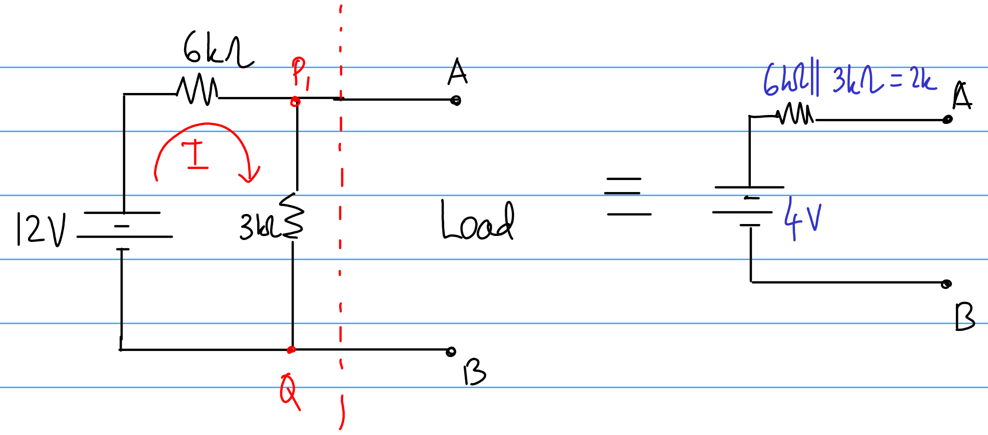


Thevenize this part & get V_{PQ}

$V_{Th} = V_{ab\,(\text{open cond}^n)} = V_{PQ} + 30V$

$R_{Th} = (10\Omega \| 40\Omega) + 8\Omega$

Fig. 5



$$I = \frac{12V}{9k\Omega} = \frac{4}{3}\,mA \;\Rightarrow\; V_{AB} = \frac{4}{3}\,mA \times 3k\Omega = 4V$$