Lab#3 Thevenin's Equivalent Circuit & Maximum Power Transfer

It is possible to replace a complicated circuit by a simple Thevenin's equivalent circuit consisting of a voltage source V_{Th} in series with a resistor R_{TH}. The maximum power transfer of 50% occurs when the load resistor RL is equal to RTH. The efficiency of power transfer [η%] is the percentage of source power transfer to the load, as provided in the manual

$$\eta\ \% = \frac{P_L}{P_S} x100\%$$

, where $\mathbf{P_L=V_LI_L}$ is the power transferred to the load and $\mathbf{P_S=V_SI_S}$ is the source power

Multisim

Please follow the steps below to setup the simulation environment and build your circuits

1. Setting up Interactive simulation environment
2. Place component on the circuit board to build your circuit

   Repeat the steps above to place all components for your circuits

Circuit	Devices	Power	GROUND (Reference Node)
Fig (3.1)	3 RESISTOR_RATED 1 VARIABLE_RESISTOR - Resistor (R): **30 kΩ**, - Increment: **1%**	DC_POWER	1 optional
Thevenin's Equivalent	1 RESISTOR_RATED 1 VARIABLE_RESISTOR	DC_POWER	1 optional
Part II Thevenin's Equivalent	Change VARIABLE RESISTOR setting to: - Resistor (R): **340 kΩ**, - Increment: **0.1%**	DC_POWER	1 optional

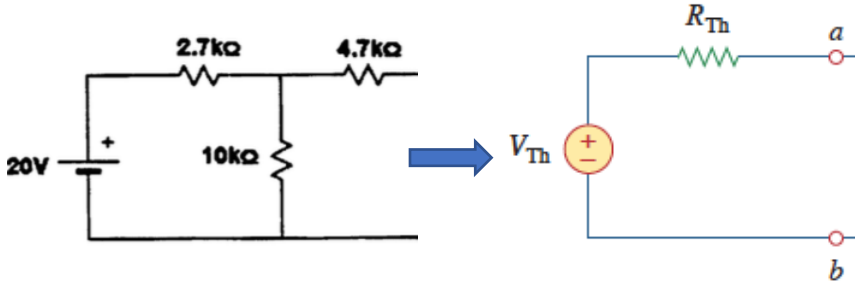
   Note: You cannot search for the VARIABLE_RESISTOR, but you can find it if you scroll down in the Family window.

3. You only need to use multimeters to measure the current and voltage.

Lab Procedure

Part I. Thevenin's equivalent circuit

1. Finding the Thevenin's equivalent circuit for the 2-terminal source network:



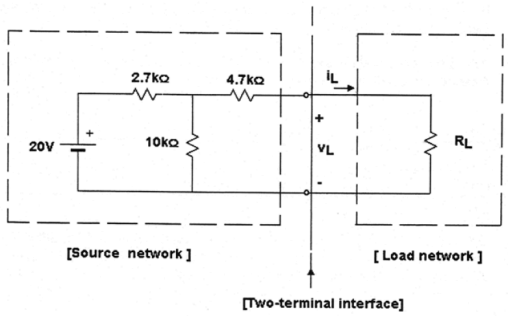
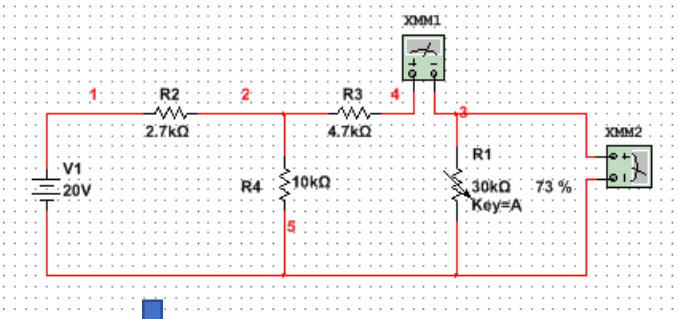
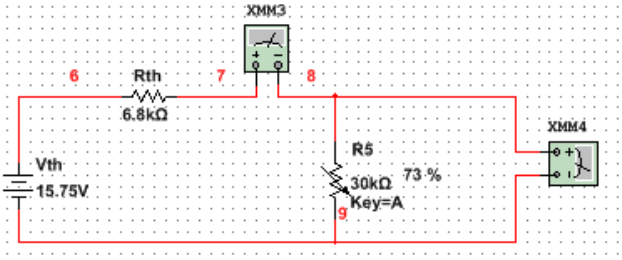


Fig (3.1)





Thevenin's Equivalent

Part II. Power Transfer

Using the same Thevenin circuit with a different load resistor setting to complete Table 3.3, using R_{TH} = 6.8 kΩ.

Hint:

- Calculate R_L first for each column before measurement. E.g. R_L/R_{TH} = 0.05 => RL = 340 Ω
- Source power can be calculated as $P_S = (R_{TH} + R_L)\, I_L^2$