BİLKENT UNIVERSITY
ELECTRICAL & ELECTRONICS ENGINEERING DEPARTMENT

EE 201 CIRCUIT THEORY

EXPERIMENT 2

Node Equations, Thevenin and Norton Equivalent Circuits, Superposition

Student Name:

ID Number:

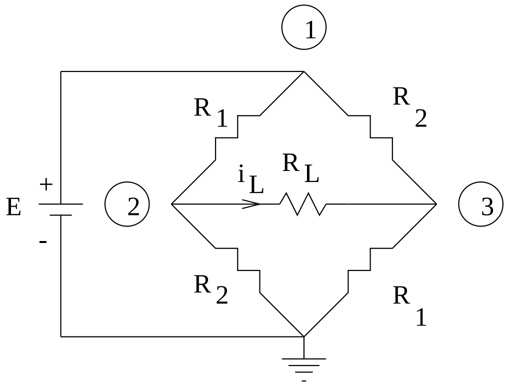
section :

Date:

Preliminary Work

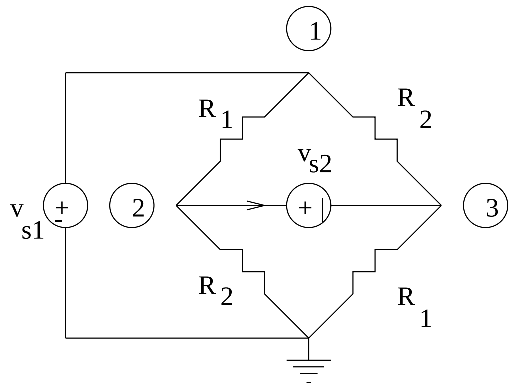
The standard resistors which are available at the lab are 1, 1.2, 1.5, 1.8, 2.2, 2.7, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2, (Ω), and their multiples of 10.

(1) Consider the following circuit. Choose the resistances in the kΩ range, while $R_1 \neq R_2$. Find the node voltages of the nodes 2 and 3, and i_L in terms of E.



(2) Consider the circuit of the problem 1. With the same resistances and $E = 10V$, find the Thevenin and Norton equivalent circuits seen from the nodes 2 and 3. (Here, R_L is not included in the equivalent circuits). Using these equivalent circuits, find the current i_L.

(3) Consider the following circuit. Use the same resistances as in the problem 1. By using superposition, find the node voltages of nodes 2 and 3 in terms of v_{s1} and v_{s2}.



EXPERIMENT:

Part 1: Construct the circuit in problem 1. Apply 4 different DC voltage for E in the range of $-10\ V \quad +10\ V$, and measure node voltages of nodes 2 and 3 and i_L. Make comment if there are differences between the computed and measured quantities.

Observation and comments:

Part 2: Construct the circuit considered in problem 2. Measure the open circuit voltage v_{23} (voltage between nodes 2 and 3), and short circuit current i_{sc} (i_L when R_L is short-circuited) and the Thevenin equivalent resistance seen from nodes 2 and 3. Measure the current i_L. Make comment if there are differences between the computed and measured quantities.

Observation and comments:

Part 3: Construct the circuit in problem 3. Choose the voltages v_{s1} and v_{s2} in $-10\ V \quad +10\ \ V$ range.

(i) Replace v_{s1} with short circuit, measure node voltages of nodes 2 and 3.

(ii) Replace v_{s2} by a short circuit and measure the same node voltages.

(iii) Apply both voltage sources and measure the same node voltages.

Make comments if there are differences between the computed and measured quantities.

Observation and comments: