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 k Ω 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 + 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 + 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: