Sekolah Pendidikan Profesional dan Pendidikan Berterusan (SPACE)

JABATAN KEJURUTERAAN ELEKTRIK
PUSAT PENGAJIAN DIPLOMA (PPD), SPACE
UNIVERSITI TEKNOLOGI MALAYSIA
KUALA LUMPUR

DDWE 1711 ELECTRICAL ENGINEERING LABORATORY 1

(CIRCUIT THEORY 1)

THEORY & PRELIMINARY LABORATORY 3

THE SUPERPOSITION AND THEVENIN'S THEOREM

Student name	**:**
Lecturer	**:**
Date	**:**

No.	PO	CO	Student Marks	Marks
1	PO1	CO1		/15

Submit the completed preliminary report to the lecture in the lab before the lab session starts.

THEORY

THE SUPERPOSITION THEOREM

Superposition is a method to determine the voltages and currents in a circuit that has many sources. It allows the calculation of the combined effect of many sources by looking at the individual effects of each source acting alone.

Each source is treated one at a time, as if it were the only ACTIVE source in the circuit. All the other sources are considered NOT ACTIVE; whereby voltage, sources are replaced by short circuits, and current sources are replaced by open circuits.

The voltage or current can be calculated by taking the components due to the first source acting alone. The calculations are repeated for each source in the circuit. When all the sources have been considered, the overall voltage or current is the algebraic sum of the individual voltage or current.

The superposition theorem will work for any number of sources as long as you are consistent in accounting for the direction of currents and the polarity of voltages.

PRELIMINARY WORK

THE SUPERPOSITION THEOREM

1. Given a circuit with two ideal voltage sources as shown in Figure 1. Find I_1 and V_3 using superposition theorem.

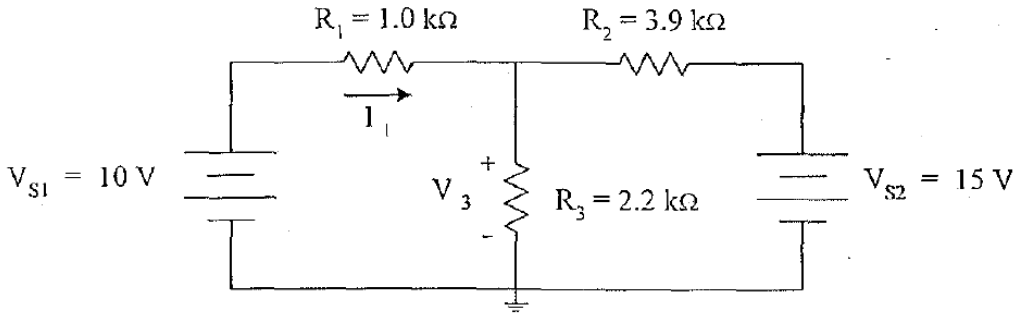

Figure 1

Answer

PO1	CO1	..... /4m

THEORY

THE THEVENIN'S THEOREM

The Thevenin's theorem provides a means of reducing a complicated, linear network into an equivalent circuit. The Thevenin equivalent circuit is composed of a voltage source in series with a resistor. To demonstrate this, we will apply the theorem to a simple three resistor circuit in Figure 2. According to the theorem, we should be able to replace the circuit to the left of terminal A-B with a Thevenin equivalent circuit as shown in Figure 3.

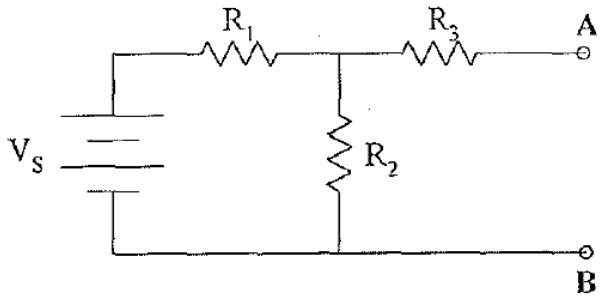

Figure 2

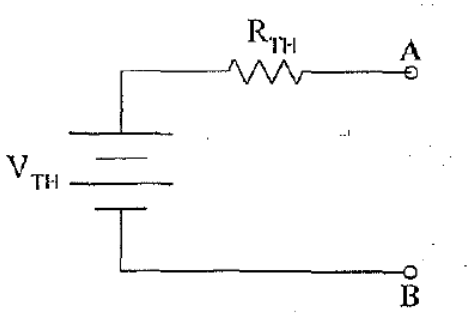

Figure 3

A device connected to the output (terminal A-B) is called a LOAD for the Thevenin circuit. If a load resistance R_L is connected across terminal A-B in both circuits of Figure 2 and Figure 3, the current flowing into R_L will be the same.

PRELIMINARY WORK

THE THEVENIN'S THEOREM

1. Referring to the circuit shown in Figure 4, calculate the current, I_L flowing through R_L for R_L = 2.2 kΩ. (Hint: solve by reducing the circuit to find the total resistance and the total current.)

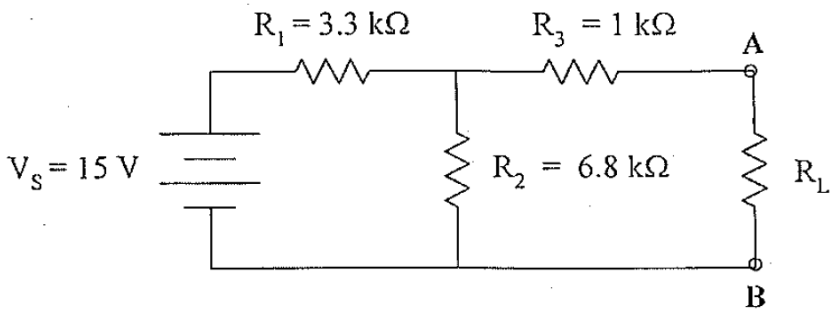

Figure 4

Answer

PO1	CO1	..... /4m

2. Referring to Figure 4, find I_L flowing through R_L for R_L = 2.2 kΩ using Thevenin's Theorem.

PO1	CO1	..... /4m

3. What can you conclude from the value of current, I_L obtained in Step 1 and Step 2.

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PO1	CO1	..... /3m