AL MUSTAQBAL UNIVERSITY COLLEGE

STUDENT NAME:		
TUTOR NAME:	**Dr. Ameer Al-khaykan**	
PROGRAMME:	**Electrical Circuit**	
SUBJECT:	**Electrical and Electronics**	
COURSEWORK TITLE:	**Norton's Theorem**	

Issue Date:	Due Date:	Feedback Date:	Extension Date:

PERFORMANCE CRITERIA:

TARGETED LEARNING OUTCOMES

4. Solve problems involving basic analogue and digital electronic circuits using numerical skills appropriate to an engineer.

5. Identify and safely use standard laboratory equipment to extract data, then apply in the solution of an electronic or electrical engineering problem;

6. Adopt a logical approach to the solution of engineering problems.

Important Information – Please Read Before Completing Your Work

All students should submit their work by the date specified using the procedures specified in the Student Handbook. An assessment that has been handed in after this deadline will be marked initially as if it had been handed in on time, but the Board of Examiners will normally apply a lateness penalty.

Your attention is drawn to the Section on Academic Misconduct in the Stu*dent's* Handbook.

All work will be considered as individual unless collaboration is specifically requested, in which case this should be explicitly acknowledged by the student within their submitted material.

Any queries that you may have on the requirements of this assessment should be e-mailed to
ameer.alkhaykan@mustaqbal-college.edu.iq
No queries will be answered after respective submission dates.
You must ensure you retain a copy of your completed work prior to submission.

MARKING CRITERIA

COURSEWORK WILL BE MARKED ACCORDING TO THE FOLLOWING UNIVERSITY CRITERIA.

90-100%: a range of marks consistent with a first where the work is exceptional in all areas;

80-89%: a range of marks consistent with a first where the work is exceptional in most areas.

70-79%: a range of marks consistent with a first. Work which shows excellent content, organisation and presentation, reasoning and originality; evidence of independent reading and thinking and a clear and authoritative grasp of theoretical positions; ability to sustain an argument, to think analytically and/or critically and to synthesise material effectively.

60-69%: a range of marks consistent with an upper second. Well-organised and lucid coverage of the main points in an answer; intelligent interpretation and confident use of evidence, examples and references; clear evidence of critical judgement in selecting, ordering and analysing content; demonstrates some ability to synthesise material and to construct responses, which reveal insight and may offer some originality.

50-59%: a range of marks consistent with lower second; shows a grasp of the main issues and uses relevant materials in a generally business-like approach, restricted evidence of additional reading; possible unevenness in structure of answers and failure to understand the more subtle points: some critical analysis and a modest degree of insight should be present.

40-49%: a range of marks which is consistent with third class; demonstrates limited understanding with no enrichment of the basic course material presented in classes; superficial lines of argument and muddled presentation; little or no attempt to relate issues to a broader framework; lower end of the range equates to a minimum falls short in one or more areas.
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35-39%: achieves many of the learning outcomes required for a mark of 40% but falls short in one or more areas.

30-34%: a fail; may achieve some learning outcomes but falls short in most areas; shows considerable lack of understanding of basic course material and little evidence of research.

0-29%: a fail; basic factual errors of considerable magnitude showing little understanding of basic course material; falls substantially short of the learning outcomes for compensation.

Note:

- While constructing circuits all connects should be made with the power supply in the off position.
- Check power and ground connections (and other connections) **before** switch on the power.
- Make sure that the power and the ground are properly connected to all IC's before switch on the power.
- **DO NOT** strip wire ends longer than 1/4" and jam long bare ends into the breadboard holes. This will cause shorts and ruin the board.
- **DO NOT** short (connect) the power supply outputs together, i.e., do not allow the exposed wires to touch each other. This will cause permanent damage to the power supply.
- **DO NOT** connect the power supply to the breadboard with reverse polarity. This will cause the permanent chip damage.

- **DO NOT** connect an output of any gate to the output of another gate, to a switch, to power (+5V), or to ground. These situations will cause excessive currents and result in the permanent damage to the chip or chips involved.

7.1-Object:

To acquire the knowledge of implementing Norton's theorem as tools in performing network reduction and analysis verify it practically.

7.2 Apparatus:

- Resistance of different ratings.
- D.c power supplies.
- Measuring instruments (volts, amps, ohms).
- Connecting wires and board.

7.3- Theory:

Norton's theorem is a variation of Thevenin´s theorem and bears a close resemblance to it. Just as Thevenin´s theorem shown how to find a simple series equivalent to an active network, so Norton's theorem shown how to find a simple parallel equivalent to an active network. Norton's theorem states that:

"Any network of circuits having two accessible terminals A and B can be replaced, so far as its external behavior is concerned, by a single current source (I_N), acting in parallel with a resistance between A and B (R_N). The value of I_N is that which flows in a zero resistance wire between A and B when the external circuits are disconnected. The value of the parallel resistance is that of the internal resistance between A and B when all active sources are replaced by their internal resistances".

There is an important relationship between the Thevenin and Norton equivalents of an active resistive network. Such relationship may be obtained by applying a source transformation to either equivalent.

$$I = \frac{E_{th}}{R_{th} + R_L}$$ As shown in Fig. (5-1.a).

If $I_N = \frac{E_{th}}{R_{th}}$ and $R_{th} = R_N$

$$I = \frac{E_{th}}{R_{th}} \times \frac{R_{th} \times R_L}{R_{th} + R_L} \times \frac{1}{R_L} \times \frac{E_{th}}{R_{th} + R_L}$$ As shown in fig. (5-1.b).

7.4- Procedure:

Connect the circuit shown in Fig (6-2) and set V_1 to fixed values which you must keep constant through out the experiment.

Norton's Theorem:

1. Repeat step 1 of section 4.1.
2. Replace R_1 by a short circuiting wire, and note ammeter reading. This is I_N.
3. Repeat step 3 of section 4.2.
4. Measure the resistance between A and B using a suitable ohmmeter. This is R_N **.**
5. Using Norton's theorem and given values of R_1, R_2, R_3, R_4, R_5, V_1 and V_2, calculate I_N **,** R_N and I_L and compare with the measure values.
6. Draw Norton's equivalent circuit.
7. Repeat step 1-6 taking R_2, R_3 , R_4, and R_5 as the load alternately.

Note: always tabulate your results

7.5- Theoretical exercise:

For the network shown in Fig. (6-3), calculate the galvo-meter (G) current using (a) Norton's theorem take the galvanometer resistance as 1.

7.6- Discussion:

1. Comment as your results. Norton's theorem explains.
2. What is the application of Norton's theorem?

7.7.Homework

For the circuit shown in Fig. (5-4) uses the Thevenin's and Norton's theorem to find the current flowing through the 6 Ω resistor.

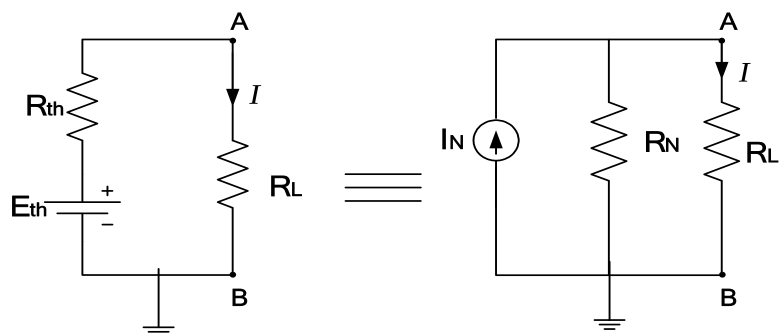

Fig (7-1)

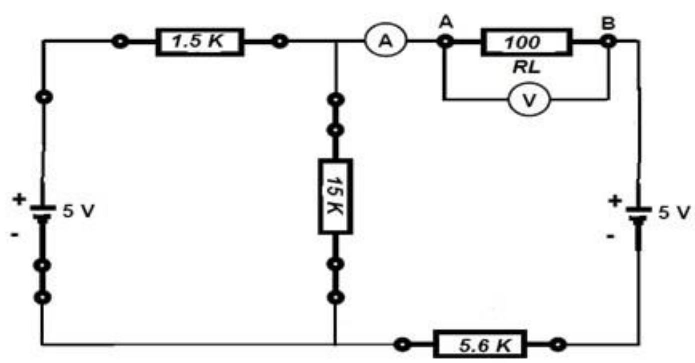

Fig (7-2)

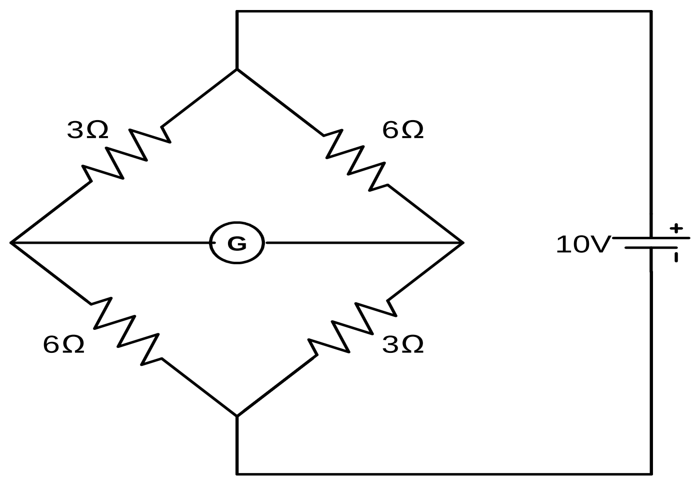

Fig (7-3)

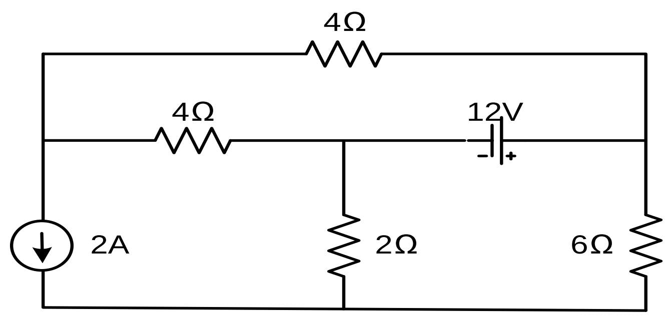

Fig (7-4)