

## Assignment 1B (25 marks) – Lab Week Three

**Due: End of your week Four's lab period – Week of 28 Jan – 3 Feb 2018**

### Simple Series Circuits

This lab exercise, leads you using Commonly Used Toolbars – Standard Toolbar, Main Toolbar, View Toolbar, Components Toolbar, Virtual Toolbar and the Instruments Toolbar in Multisim, which will be used extensively in this lab exercise. It also confirms your understanding of class/hybrid material. This lab work constitutes 25% of Assignment One's overall mark.

### PURPOSE OF LAB:

The purpose of this lab is to confirm your understanding of the course lecture material by building and analyzing several simple electronic circuits that contain batteries, switches, resistors, lamps, and fuses. You will also analyze paper-based series circuits, and work with engineering notation as part of your hand in for this lab.

I highly recommend that you make notes of the lab video and that you understand the concepts contained in this lab, as other assessments in the course will test you on this knowledge.

If you have ANY questions concerning this material, please ask me during the lab period. Remember – this is a LEARNING process.

### MSM13 Directory Structure

All of the files in this lab should be stored on your hard drive or flash drive called CST8216\Lab3.

Save your work OFTEN!

### Lab Procedure

#### Lab Week Three Prelab Work - Multisim Test Equipment Videos

1. Prior to commencing with this lab exercise, download the Multisim Test Equipment tutorial file, which is located on Blackboard in the same folder as this document.
2. After downloading the file, unzip it and click on either of the **.html** files or the **.mp4** file to view the video. Note that you will require an audio headset to listen to the audio component of the video. The use of three pieces of test equipment are contained in the video, all of which are accessible using the video's Table of Contents, which is accessible when using an **.html** version of the video in the browser's lower right-hand side.



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#### Lab Week Three Video

1. Now, download the Lab Week Three video, which is located on Blackboard in the same folder as this document. Note that you will require an audio headset to listen to the audio component of the video. This video will provide you with amplifying background on the various Multisim Toolbars and guide you through building six small circuits in Multisim.
2. After downloading the file, unzip it and click on either of the **.html** files or the **.mp4** file to view the video. Once you have completed the instructions in the video, you should have the following six files in your CST8216\Lab3 folder:

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Multimeter1.ms13
Multimeter2.ms13
Multimeter3.ms13
Lamp1.ms13
Lamp2.ms13
Lamp3.ms13
  
```

3. Once you have created the above circuits and analyzed them, complete the questions following this page and submit their answers according to the instructions on Lab Week Three Hand-In Sheet.

**Note:** Within the video for this this there are questions about some important concepts that you should understand. If you have difficulty with the questions or you would like clarification on their answers, then use your lab time to discuss this material with me. I would be most pleased to help with your understanding of this course material.

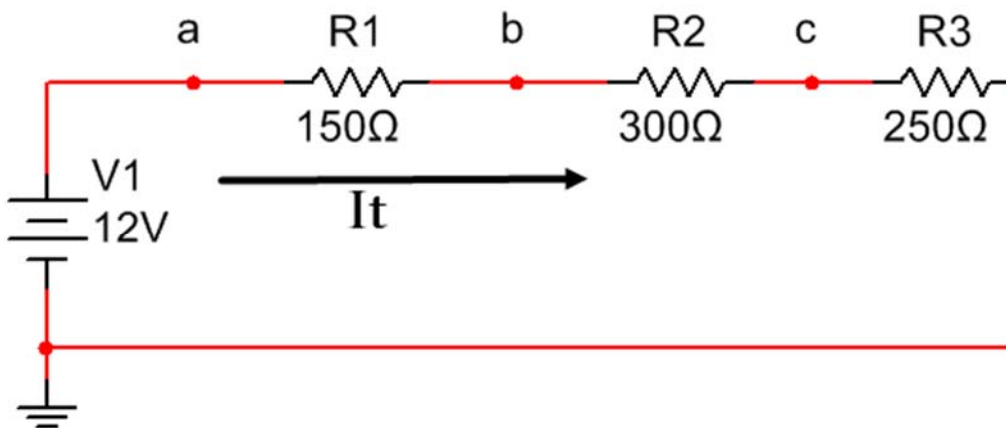
Answer all of the Multiple Choice Questions for Circuit One and Circuit Two on the hand-in sheet.

Answer the following questions on the answer sheet near the back of this lab exercise.

MULTIPLE CHOICE. Choose the one alternative that best answers the question.

① mark each

## Circuit One

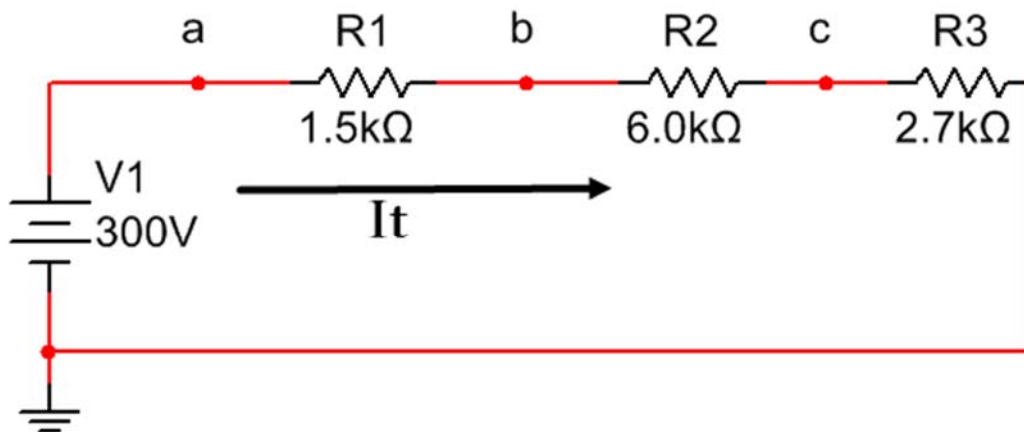


- 1) Calculate  $R_t$  for Circuit One.  
A) 500  $\Omega$       B) 700  $\Omega$       C) 36.6  $\Omega$       D) 350  $\Omega$
- 2) Calculate  $I_t$  for Circuit One.  
A) 1.7 A      B) 171.4 mA      C) 17.14 mA      D) 17.14  $\mu$  A
- 3) Calculate  $V_b$  for Circuit One.  
A) 2.57 V      B) 9.43 V      C) 5.14 V      D) 12 V
- 4) Calculate  $V_{ab}$  for Circuit One.  
A) 2.57 V      B) 9.43 V      C) 5.14 V      D) 12 V
- 5) Calculate  $V_{R3}$  for Circuit One.  
A) 12 V      B) 0 V      C) 5.14 V      D) 4.29 V
- 6) Calculate  $P_t$  for Circuit One.  
A) 12 V      B) 205.7 mW      C) 205.7 W      D) 205.7  $\mu$ W

Answer the following questions on the answer sheet near the back of this lab exercise.

MULTIPLE CHOICE. Choose the one alternative that best answers the question. ① mark each

## Circuit Two



- 7) Calculate  $R_t$  for Circuit Two.  
A) 102 k $\Omega$       B) 1202  $\Omega$       C) 10.2 k $\Omega$       D) 831  $\Omega$
- 8) Calculate  $I_t$  for Circuit Two.  
A) 2.94 A      B) 0.294 mA      C) 29.4  $\mu$  A      D) 29.4 mA
- 9) Calculate  $V_c$  for Circuit Two.  
A) 7.94 V      B) 79.4 kV      C) 79.4 V      D) 300 V
- 10) Calculate  $V_{bc}$  for Circuit Two.  
A) 176.47 V      B) 176.47 kV      C) 300 V      D) 176.47 mV
- 11) Calculate  $V_{R3}$  for Circuit Two.  
A) 79.4 V      B) 7.94 V      C) 4412 V      D) 300 V
- 12) Calculate  $P_t$  for Circuit Two.  
A) 0.882 W      B) 8.82  $\mu$ W      C) 8.82 mW      D) 8.82 W

**Lab Week Three Hand-In Sheets (Due: End of your week Four's lab period)**

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**Due: End of your week Four's lab period Week of 28 Jan – 2 Feb 2018**

/ 25 marks

**Name:** \_\_\_\_\_**Write in your Lab Date and Time (e.g. Wed 10 – 12)****Student Number:** \_\_\_\_\_**Instructions**

To gain credit for this portion of Week Three's lab, independently complete the lab exercise and questions on the following two pages and submit them into your lab portfolio by the date indicated at the top of this page.

PLEASE STAPLE THE PAGES TOGETHER.

**Multiple Choice Answer Sheet – To Be Used for the Circuit One and Circuit Two Questions**

To indicate your answer, circle the appropriate letter for each question. If you make a mistake, cross out the letter with an **X** and write the letter you want at the end of the row, for example:

Only handwritten work is eligible for credit!

1)	A	B	<del>C</del>	D
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D

**1** mark each

**Circle your answers for Circuit One and Circuit Two Questions**

1)	A	B	C	D
2)	A	B	C	D
3)	A	B	C	D
4)	A	B	C	D
5)	A	B	C	D
6)	A	B	C	D
7)	A	B	C	D
8)	A	B	C	D
9)	A	B	C	D
10)	A	B	C	D
11)	A	B	C	D
12)	A	B	C	D

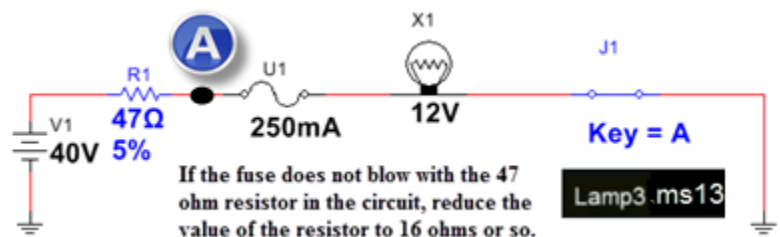
**3** marks

**Demonstration of Multisim Circuit**

13) Demonstrate **Lamp3.ms13** during your lab period. Be prepared to explain to me how a fuse works and be able to measure the voltage on the right-hand side of R1 (e.g. at Point A) with respect to ground by correctly using a multimeter. What you should be demonstrating is  $V_A$  before and after the fuse blows.

Have the Multimeter correctly set up to measure  $V_A$  **before** you come up to demonstrate this circuit.

Professor's Initials: \_\_\_\_\_



14) Neatly complete the following questions for the given circuit, in the space provided below.

For full credit:

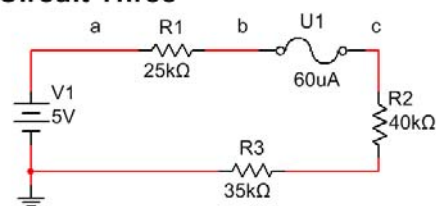
- Neatly show all work (**formulas and calculations**) in the Solutions column in your own handwriting, using correct engineering prefixes (e.g. k, m,  $\mu$ , p, M) and correct symbols (e.g. V, A,  $\Omega$ , W) in all your calculations. Pay attention to your CaPiTaLiZaTiOn (example MV  $\neq$  mV, K  $\neq$  k).
- Neatly write your calculated answer in the Answer column.

Example (from a different question)

① mark each

Only handwritten work is eligible for credit!

Circuit Three



#	Required Calculation	Solution	Answer
c.	Calculate $V_{R1}$	$V_{R1} = I \cdot R_1$ $= 6\mu A \cdot 4k\Omega$ $= 24mV$ <p>← Formula ← Calculations</p>	$V_{R1} = 24mV$

Neatly complete the following question for Circuit Three.

#	Required Calculation	Solution	Answer
a.	Calculate the Total Resistance ( $R_t$ ).		
b.	Calculate the Total Current ( $I_t$ ). Express your answer in microamperes using correct engineering notation.		
c.	Calculate $V_{R1}$		
d.	Calculate $V_{R2}$		
e.	Calculate $V_{R3}$		
f.	Calculate $V_b$ (Do NOT use $V_b = V_{R2} + V_{R3}$ )		

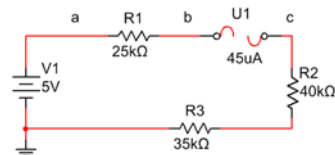
15). Neatly complete the following question for Circuit Four.

Assume that someone replaced Circuit Three's fuse with a one that has a smaller current rating and that the fuse has blown as shown in Circuit Four. Calculate  $V_b$  again, including all formulas used in your calculation.

④ marks

Only handwritten work is eligible for credit!

Circuit Four



#	Required Calculation	Solution	Answer
a.	Calculate $V_b$		