Family Name ....

Given Name ....

Student No. ....

Signature ....

THE UNIVERSITY OF NEW SOUTH WALES

School of Electrical Engineering & Telecommunications

MID-SESSION EXAMINATION

S1 2016

ELEC1111
Electrical Circuits

TIME ALLOWED:	**55 minutes**
TOTAL MARKS:	**40**
TOTAL NUMBER OF QUESTIONS:	**5**

THIS EXAM CONTRIBUTES 20%TO THE TOTAL COURSE ASSESSMENT

Reading Time: 5 minutes.

This paper contains 3 pages.

Candidates must **ATTEMPT ALL** questions.

Answer all questions in the answer booklet provided.

Marks for each question are indicated beside the question.

This paper **MAY** be retained by the candidate.

Print your name, student ID and question number on the front page of each answer book.

Authorised examination materials:

Candidates should use their own UNSW-approved electronic calculators.

This is a closed book examination.

Assumptions made in answering the questions should be stated explicitly.

All answers must be written in ink. Except where they are expressly required, pencils **may only be used** for drawing, sketching or graphical work.

QUESTION 1 [4 marks]

For the circuit in Figure 1 below, calculate the equivalent resistance R_{eq} of the network as seen from the terminals shown.

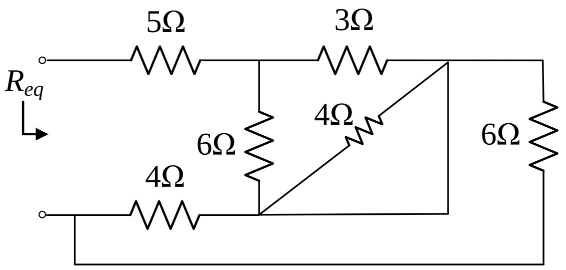

Figure 1

QUESTION 2 [8 marks]

For the circuit below in Figure 2, apply nodal analysis, and write down the node voltage equations using the labels shown in Fig. 2. Note: You should NOT solve them.

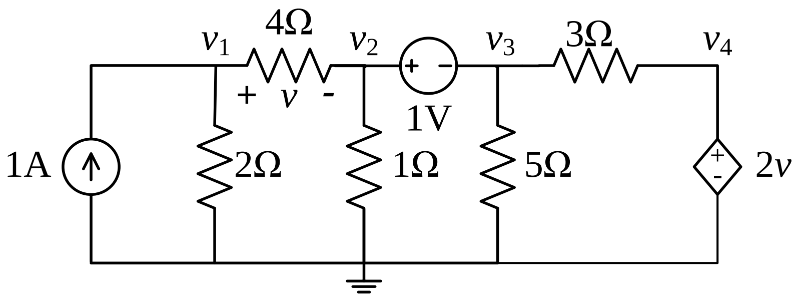

Figure 2

QUESTION 3 [8 marks]

For the circuit shown below in Figure 3, use mesh analysis to write down mesh equations and solve for the mesh currents labelled i_1, i_2, and i_3.

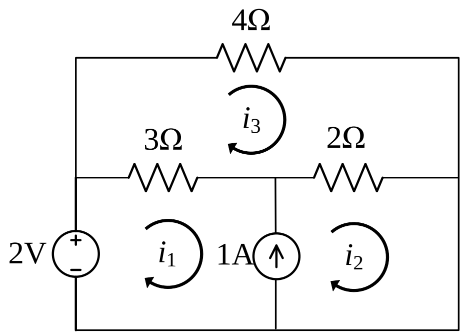

Figure 3

QUESTION 4 [12 marks]

(a) (6 marks) For the circuit below in Figure 4, showing sketches in your working, use the superposition principle to determine the current *i* that flows in the 20 Ω resistor.

(b) (6 marks) Using source transformation, find the Norton equivalent of the circuit to the left of the terminal pair A-B in Figure 4.

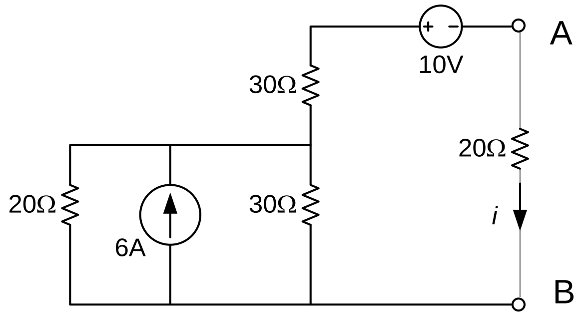

Figure 4

QUESTION 5 [8 marks]

For the circuit below in Figure 5, the switch has been in the same position for a long time before changing position as shown at time $t = 0$.

(a) (4 marks) Calculate the capacitor voltage $v_C(t)$
  (i) immediately after the switch closes, i.e. $v_C(0^+)$, and
  (ii) as $t \to \infty$, i.e. $\lim_{t\to\infty} v_C(t)$.

(b) (4 marks) Give an expression for the capacitor voltage $v_C(t)$ (i.e. as a function of time) for $t > 0$. Explain how you arrived at this expression.

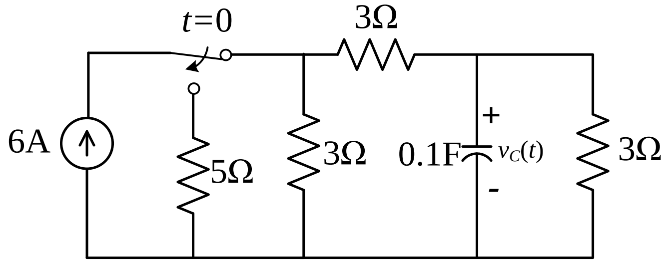

Figure 5

END OF PAPER