CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
SEPTEMBER 2013 SESSION

SUBJECT CODE	:	**FEB 10103**
SUBJECT TITLE	:	**CIRCUIT THEORY**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**2.5 HOURS**
DATE	:	

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.

2. This question paper is printed on both sides of the paper.

3. Please write your answers on the answer booklet provided.

4. Answer should be written in blue or black ink except for sketching, graphic and illustration.

5. This question paper consists of TWO (2) sections. Section A and B. Answer all questions in Section A. For Section B, answer three (3) question only.

6. Answer all questions in English.

7. Do not open the question paper until instructed to do so.

THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.

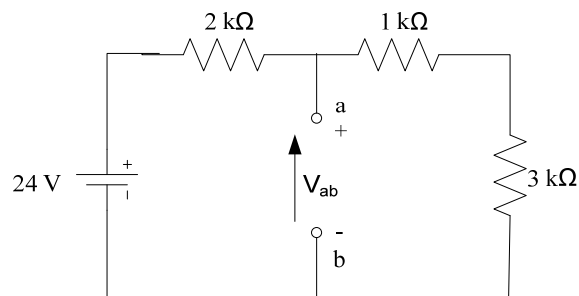**Please use the answer booklet provided.**

Question 1

(a)   Define:

      (i)   Kirchhoff's voltage law

      (ii)   Kirchhoff's current law

                                                                         (4 marks)

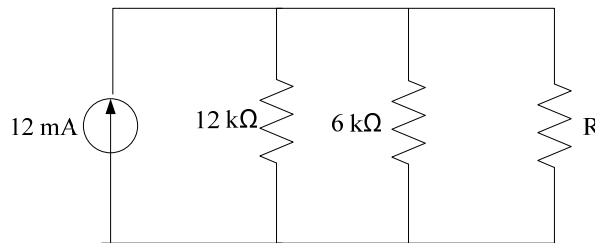(b)   Determine the voltage V_{ab} in circuit as shown in **Figure 1** using Kirchhoff's voltage law (KVL).

                                                                          (3 marks)

Figure 1

(c)   A resistor of **R** is to be connected in parallel with the circuit as shown in **Figure 2**, so that the current through the 12 kΩ resistor is 2 mA. Determine the value of resistance **R**.

                                                                         (3 marks)

Figure 2

Question 2

(a)   An AC voltage can be represented by a sinusoidal waveform. Define:

        (i)   the period, **T**

        (ii)   the frequency, **f**

                                                                       (4 marks)

(b)   An alternating voltage has the mathematical expression of, $v(t) = 169.8 \sin 377t$ V. Determine:

        (i)   the angular velocity, **ω**

        (ii)   the frequency, **f**

        (iii)   the period, **T**

        (iv)   the instantaneous voltage at **t = 3 ms**

        (v)   Plot the graph for **v(t)** versus **t**

                                                                     (8 marks)

(c)   Carbon composition resistors are available with power rating of $^1/_8$ W, ¼W, ½W, 1W and 2W. The circuit values of voltage, current, and/or resistance are given as follows. Determine the minimum power rating that the carbon composition resistor can have.
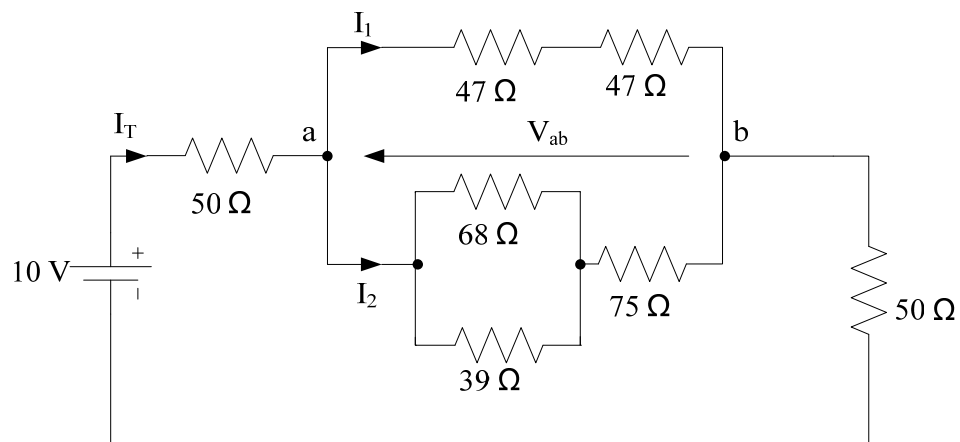
        (i)   R = 1.5 kΩ   I = 20 mA

        (ii)   V = 50 mV   I = 0.2 A

                                                                          (4 marks)

Question 3

A series-parallel circuit shown in **Figure 3** is connected to a 10 V voltage source. Calculate:

(a)   The total resistance

(3 marks)

(b)   The total current, I_T.

(2 marks)

(c)   The current I_1, and I_2

(4 marks)

(d)   The voltage V_{ab}

(3 marks)

(e)   The total power delivered

(2 marks)

Figure 3

SECTION B (Total: 60 marks)

INSTRUCTION: Answer only THREE (3) questions.

Please use the answer booklet provided.

Question 4

A series-parallel circuit as shown in **Figure 4** is connected to 100 volts AC voltage source. Determine:

(a)   The total impedance, **Z$_T$**.

(6 marks)

(b)   The current, **I$_1$**, **I$_2$** and **I$_3$**.

(8 marks)

(c)   The voltage across parallel branch, **V$_X$**.

(2 marks)

(d)   Draw the phasor diagram for **V**, **I$_1$**, **I$_2$** and **I$_3$**.

(4 marks)
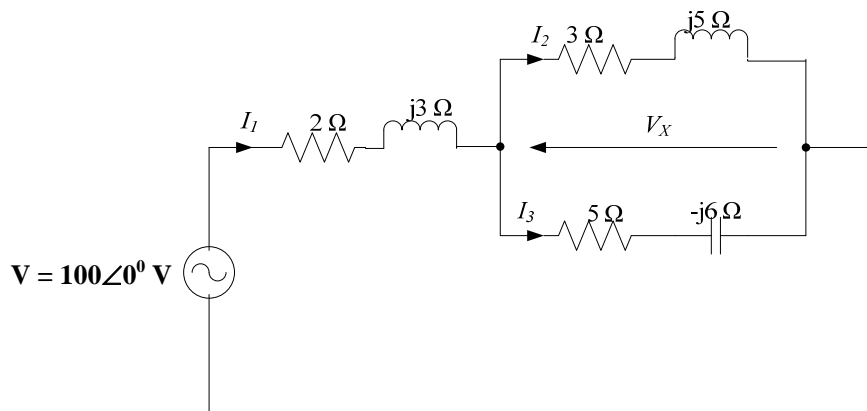
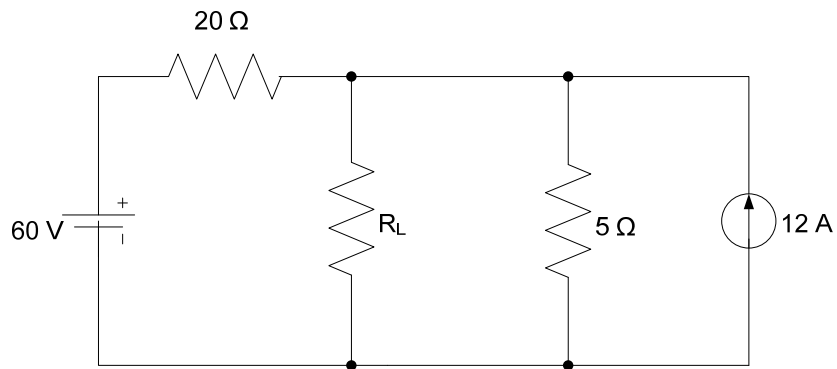**Figure 4**

Question 5

Figure 5 shows a multi source circuit with a voltage and current source

(a)　Determine the Thevenin's equivalent across the R_L.

(14 marks)

(b)　If the load $R_L = 6\ \Omega$, determine the current through the load.

(3 marks)

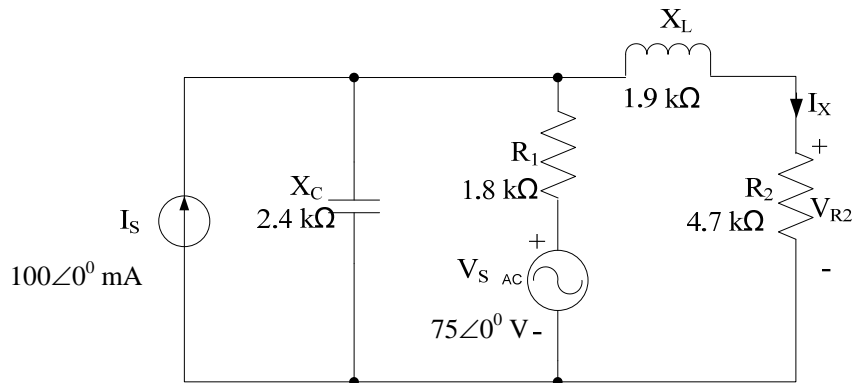(c)　Calculate the power dissipated through R_L

(3 marks)

Figure 5

Question 6

A multi-source circuit as shown in **Figure 6** is connected to a current source and a voltage source. Using the superposition theorem, determine:

(a)　The current through R_2, I_X

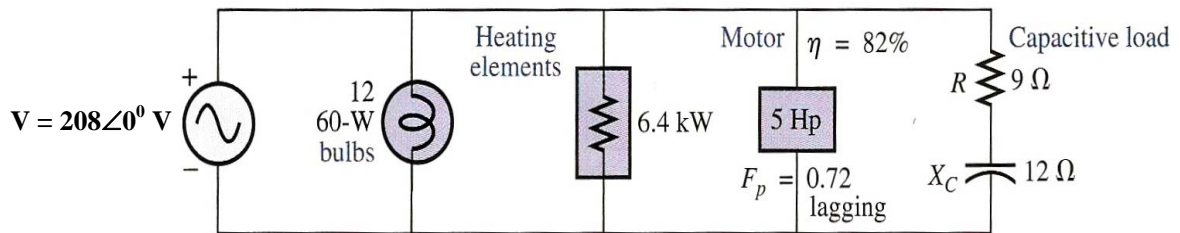(b)　The voltage across R_2, V_{R2}

(20 marks)

Figure 6

Question 7

Figure 7 shows several loads connected to AC voltage source. The load consists of twelve (12) 60 W bulb, a 6.4 kW heating elements, a 5 hp motor (efficiency 82 % and power factor 0.72 lagging) and a capacitive load. Determine:

(a)   The total average power, the total reactive power and the total apparent power.

(14 marks)

(b)   The overall power factor.

(2 marks)

(c)   The source current.

(2 marks)

(d)   Draw the power triangle.

(2 marks)

Figure 7

END OF QUESTION PAPER