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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JANUARY 2014 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) questions only.**
6. **Answer all questions in English.**

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) State the definition of:

(i) Kirchoff's Voltage Law (KVL)

(ii) Kirchoff's Current Law (KCL)

(4 marks)

(b) **Figure 1** shows the series circuit with the 60V supply.

(i) Find the current ***I***.

(ii) Determine the voltage V_2.

(iii) Determine the voltage V_1 using Kirchhoff's voltage law.

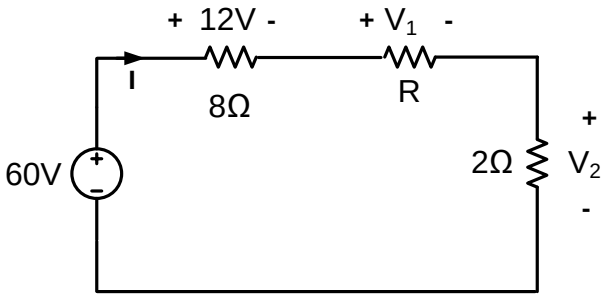

Figure 1

(4 marks)

(c) Using Kirchoff's current law, determine the current I_2 and I_S for the parallel circuit in **Figure 2**.

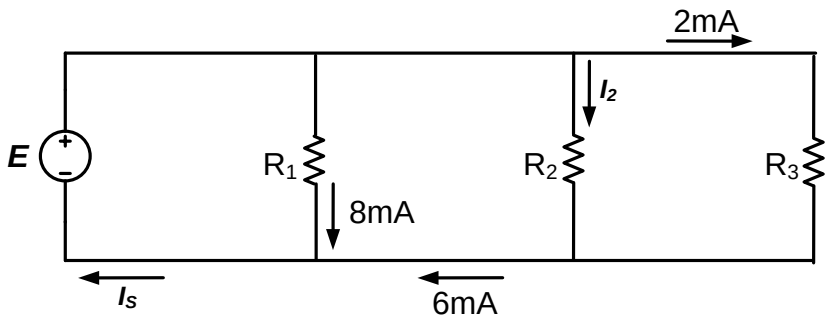

Figure 2

(4 marks)

Question 2

For the circuit in **Figure 3** below, determine the:

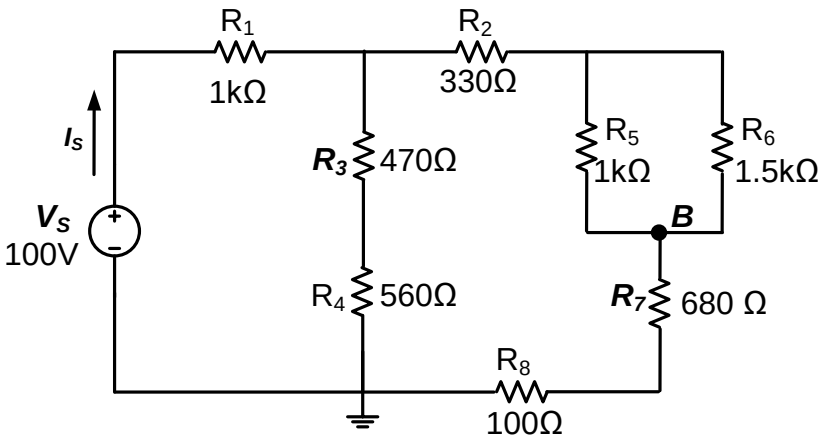

Figure 3

(a) Total resistance circuit (5 marks)

(b) Total current, (I_S) (2 marks)

(c) Current through R_3 and R_7. (4 marks)

(d) Voltage at node ***B*** with respect to ground, (V_B). (2 marks)

Question 3

(a) **Figure 4** shows the sinusoidal waveform with **T=50ms**. Write the equation for the waveforms of ***i*** in **Figure 4**. Express the phase angle in degrees.

(4 marks)

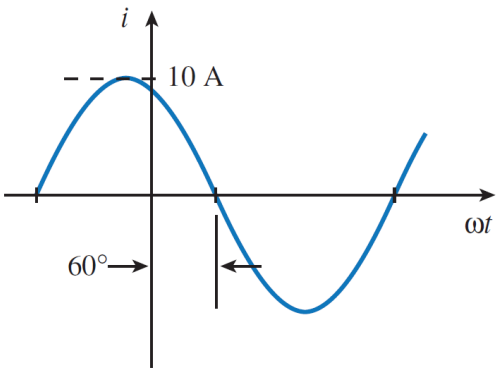

Figure 4

(b) With the following pairs of sinusoidal equations:

$$v = 100 \sin(\omega t + 140°)$$
$$i = 80 \sin(\omega t - 160°)$$

(i) Sketch the phasor diagram (2 marks)

(ii) Determine the phase difference between the waveforms and identify which waveform leads.

(2 marks)

Question 4

Figure 5 shows the capacitor circuit.

(a) Determine the total capacitance, $\mathbf{C_T}$

(b) Find the voltage across C1 and C3 if V_{DC}=100 V is applied to terminals *a*-*b*.

(7 marks)

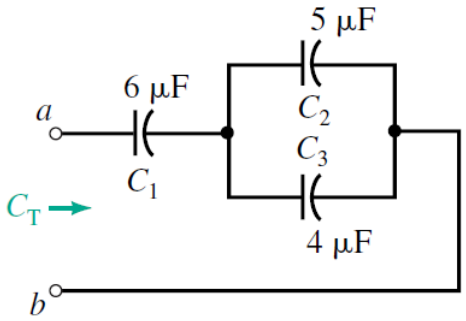

Figure 5

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions only

Please use the answer booklet provided.

Question 5

Based on the circuit in **Figure 6**:

(a) Write the loop-current (mesh-current) equations.

(b) Solve for $\mathbf{I_1}$ and $\mathbf{I_2}$.

(c) Determine the voltage $\mathbf{V_{ab}}$.

(20 marks)

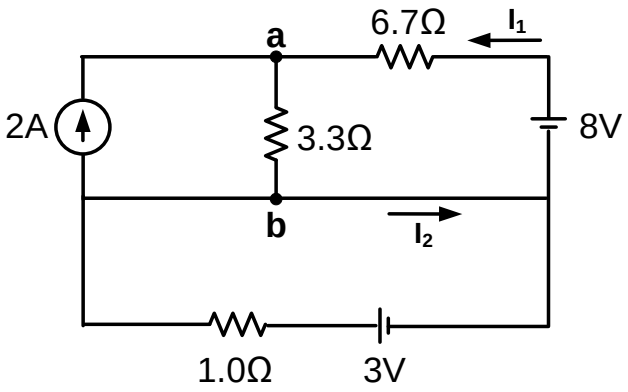

Figure 6

Question 6

(a) Based on the circuit in **Figure 7**, find the thevenin equivalent circuit at terminal **AB.**

(b) Using the equivalent circuit in part (a), determine:

i. Current through the load resistance, $\boldsymbol{R_L}$.

ii. Power dissipated in R_L

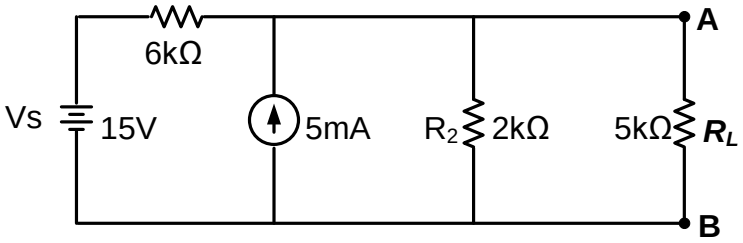

Figure 7

(20 marks)

Question 7

Figure 8 show the AC network, by using the superposition theorem, determine the voltage drop, $V_0(t)$ across capacitor,.

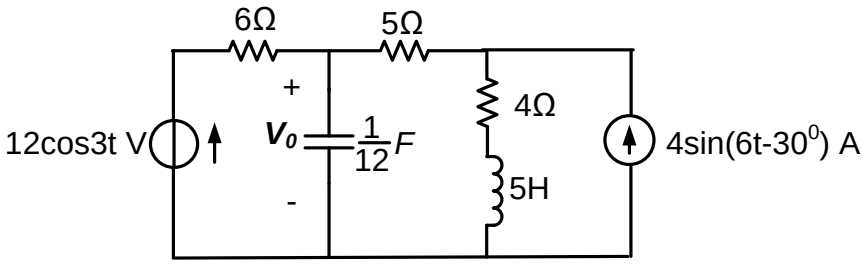

Figure 8

(20 marks)

Question 8

The load in most electrical power systems is predominantly inductive, so most have lagging power factors. This is an uneconomical situation for utility companies, who would prefer to have a unity power factor (F_P **=1**). To achieve a unity power factor, the capacitive loads need to install in the system. Based on the above statement, analyze the power distribution system in **Figure 9**:

(a) without capacitive loads, ***C*** and hence calculate :

(i) The total apparent power, S_T.

(ii) The total current, i_T.

(iii) The power factor, F_P

(10 marks)

(b) by installing the capacitive load, ***C*** parallel to the load and hence calculate :

(i) The capacitive VARs, (Q_C) that must be produced by capacitance **C** to make the power factor of the system equal unity.

(ii) The capacitance **C** necessary to achieve the power factor in part (iii).

(iii) The total power apparent power S_T.

(iv) The total i_T

(10 marks)

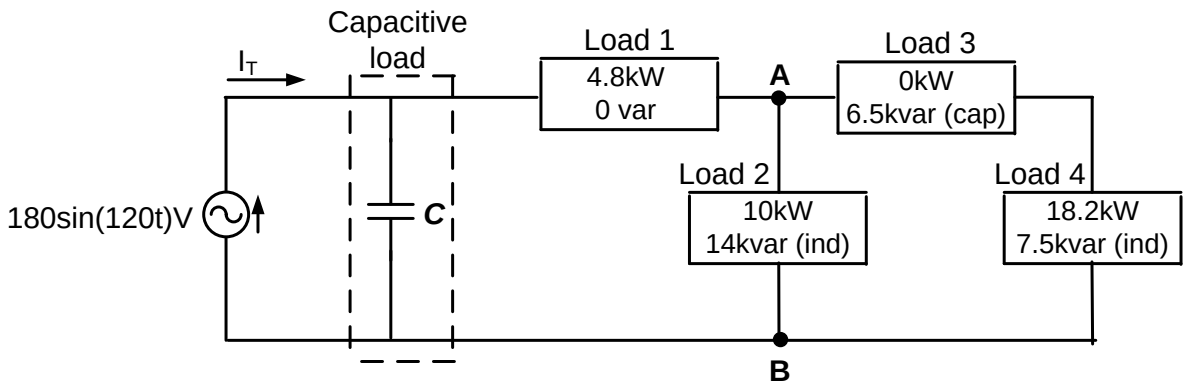

Figure 9

END OF QUESTION PAPER