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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 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 7 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) Refer to the circuit of **Figure 1:**

(i) Use Kirchhoff's voltage law to find the voltage drops across R_2 and R_3.

(ii) Determine the magnitude of the current **I**.

(iii) Solve for the unknown resistance R_1.

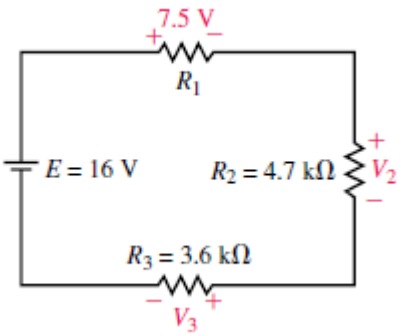


Figure 1

(6 marks)

(c) Refer to the network of **Figure 2**:

(i) Use Kirchhoff's current law to solve for the unknown currents I_1, I_3 and I_4.

(ii) Calculate the voltage **V** across the network.

(iii) Determine the values of the unknown resistors R_1, R_3 and R_4.

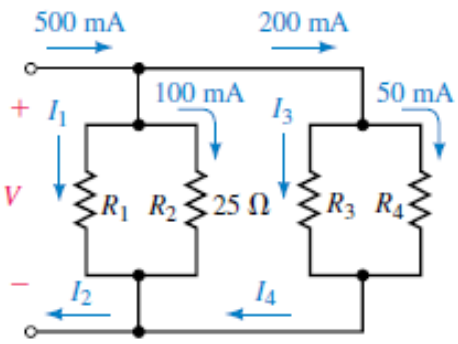


Figure 2

(4 marks)

Question 2

Refer to the circuit of **Figure 3**, find the following quantities:

(a) The total resistance of the circuit, $\mathbf{R_T}$

(b) The indicated currents $\mathbf{I_3}$ and $\mathbf{I_4}$

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

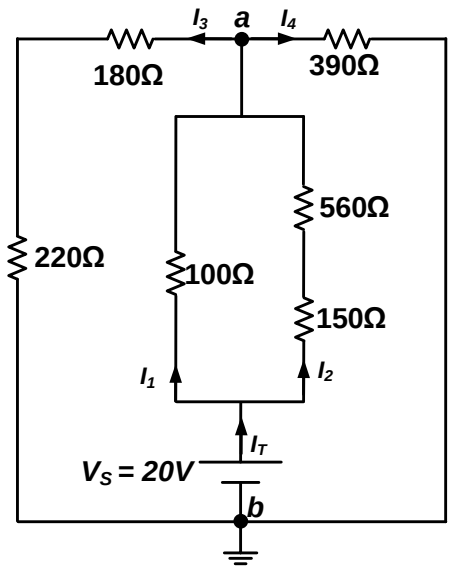


Figure 3

(14 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)

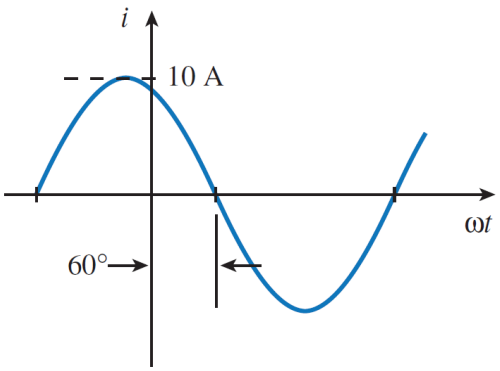


Figure 4

(b) With the following pairs of sinusoidal equations:

$$v = 100 \sin(\omega t + 140°)\ V$$

$$i = 80 \sin(\omega t - 160°)\ A$$

(i) Sketch the phasor diagram

(2 marks)

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

(2 marks)

Question 4

A dc source is connected to terminals *a-b* of **Figure 5**. If the voltage across the 40μF capacitor is 80 V,

(a) Calculate the source voltage.

(b) Find the total charge on the capacitors.

(4 marks)

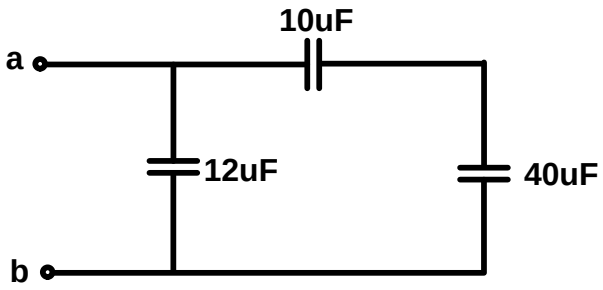


Figure 5

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions only

Please use the answer booklet provided.

Question 5

Based on the given conditions for the transistor circuit of **Figure 6,** determine:

(a) I_C

(b) V_{CE}.

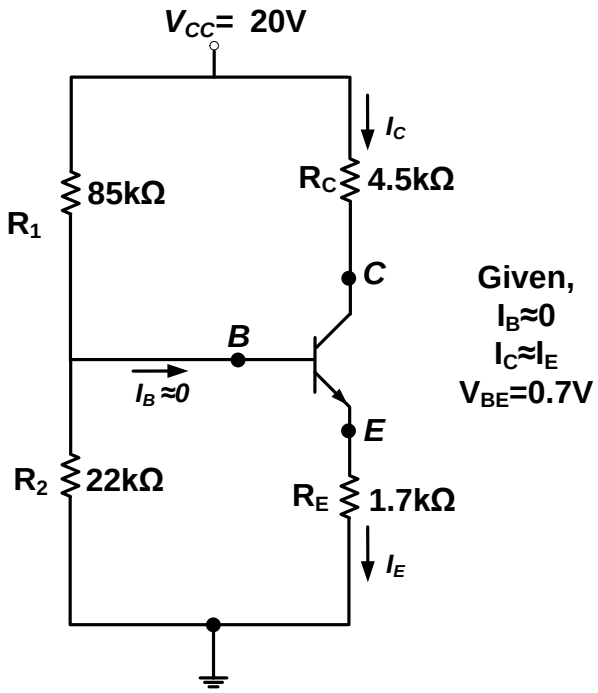


Figure 6

(20 marks)

Question 6

Refer to the circuit of **Figure 7**.

(a) Find $\mathbf{Z_T}$, $\mathbf{I_T}$, $\mathbf{I_1}$, and $\mathbf{I_2}$.

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

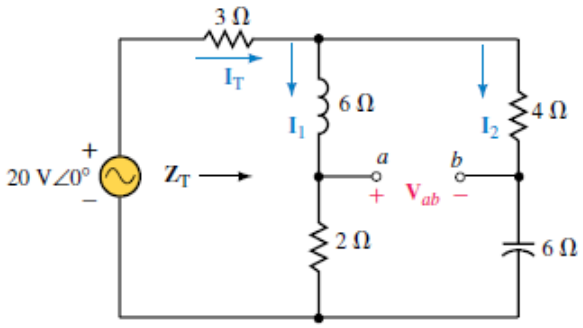


Figure 7

(20 marks)

Question 7

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

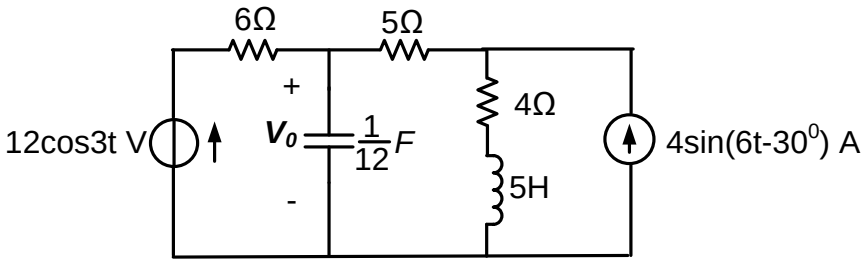
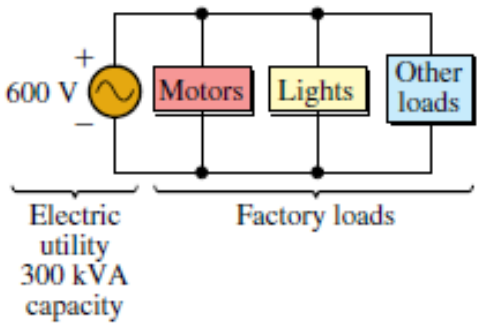


Figure 8

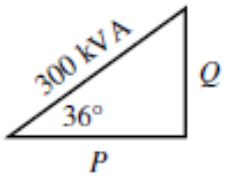
(20 marks)

Question 8

(a) A small electrical utility has a 600-V, 300-kVA capacity as shown in **Figure 9**. It supplies a factory with the power triangle shown in (b). This fully loads the utility. If a power factor correcting capacitor corrects the load to unity power factor, calculate the apparent power (kVA) at unity power factor.



(a)



(b) Factory power triangle

Figure 9

(8 marks)

(b) Refer to the circuit of **Figure 10**.

(i) Find the Thévenin equivalent circuit external to the indicated load at a frequency of 5 kHz.

(ii) Determine the power dissipated by the load if $\mathbf{Z_L = 100\Omega \angle 30°}$.

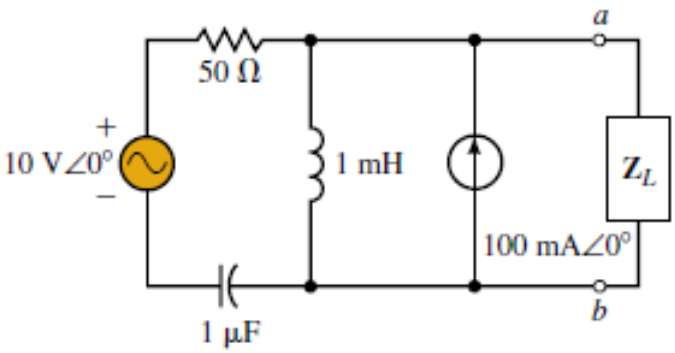


Figure 10

(12 marks)

END OF QUESTION PAPER