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CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2011 SESSION

SUBJECT CODE	:	FEB 10103
SUBJECT TITLE	:	CIRCUIT THEORY
LEVEL	:	BACHELOR
TIME / DURATION	:	9.00am – 12.00pm (3 HOURS)
DATE	:	14 MAY 2011

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. Voltage
ii. Current
iii. Resistance
iv. Kirchoff's Current Law (KCL)

(4 marks)

(b) If a resistor with a current of 2A through it converts 1000J of electrical energy into heat energy in 15s, what is the voltage across the resistor?

(2 marks)

(c) Determine the resistance and tolerance of each of the following 4-band resistors:

i. Brown, gray, red, silver
ii. Red, violet, orange, gold

(4 marks)

Question 2

Refer to **Figure 1**, by given total resistance, R_T = 773 Ω, determine:

(a) The Vs

(2 marks)

(b) The value of each resistor.

(4 marks)

(c) The total power delivered to the circuit.

(3 marks)

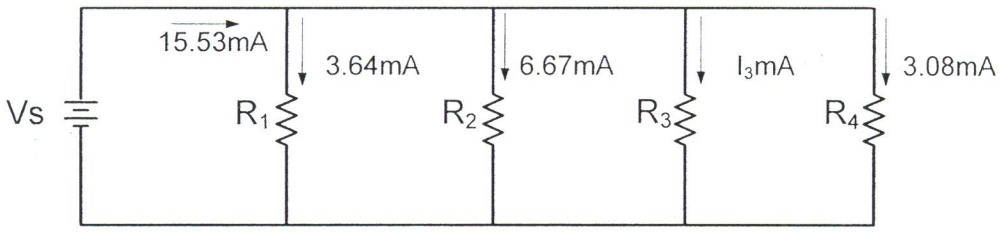


Figure 1

Question 3

(a) Referring to the **Figure 2**, an alternating voltage has the equation ***v(t)*=100sin377t *V***.
Determine:

i. Peak voltage, V_P
ii. Effective value (r.m.s voltage), V_{rms}
iii. The frequency, **f**
iv. The period, **T**
v. Instantaneous voltage at ***t = 1 ms***

(5 marks)

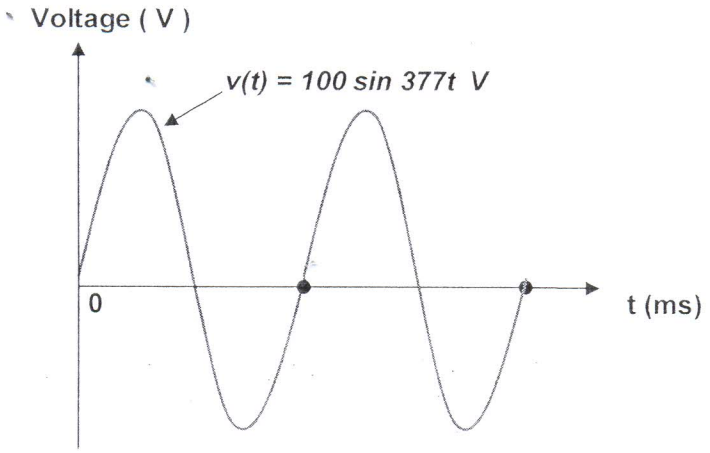
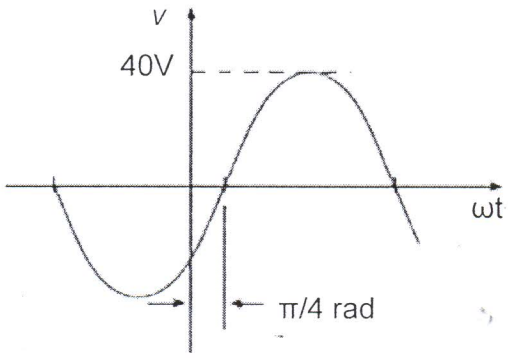


Figure 2: An alternating voltage waveform

(b) Write equation for the waveform of **Figure 3**. Express the phase angle in degree.



f=900Hz

Figure 3

(2 marks)

(c) Refer to the circuit in **Figure 4**.

i. Find total impedance Z_T

ii. Determine the voltages V_R and V_L using the voltage divider rule

iii. Verify Kirchoff's voltage law around the close loop

(4 marks)

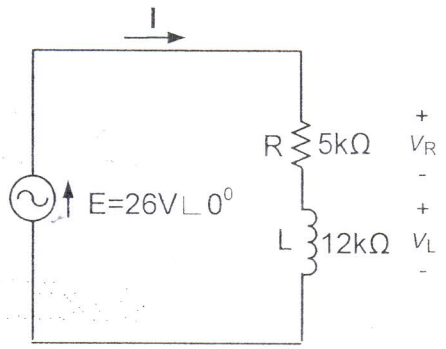


Figure 4

Question 4

Figure 5 shows Series-parallel AC circuit, calculate:

(a) The total impedance $\boldsymbol{Z_T}$

(4 marks)

(b) The supply current **I**

(1 marks)

(c) The circuit phase angle and power factor *PF*

(1 marks)

(d) Currents $\mathbf{I_1}$ and $\mathbf{I_2}$

(4 marks)

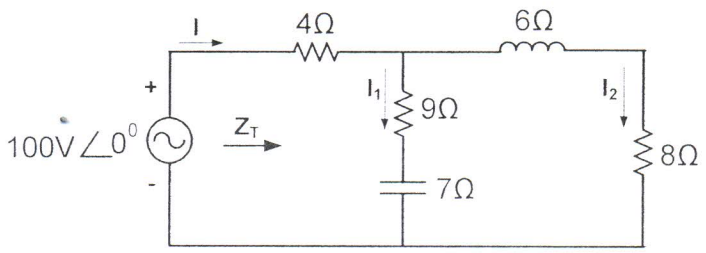


Figure 5

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions only

Please use the answer booklet provided.

Question 5

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

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

(6 marks)

(b) Solve for I_1 and I_2.

(10 marks)

(c) Determine the voltage V_{ab}.

(4 marks)

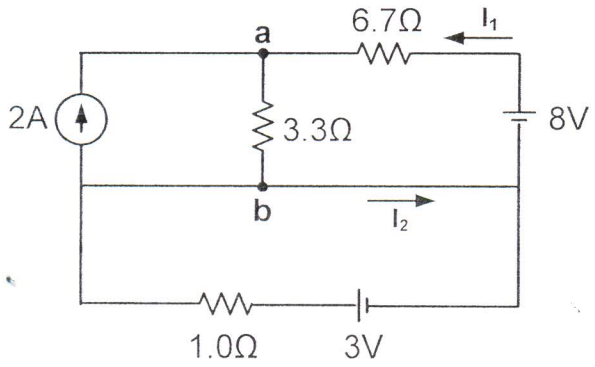


Figure 6

Question 6

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

(16 marks)

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

i. Current through the load resistance.

ii. Power dissipated in R_L

(4 marks)

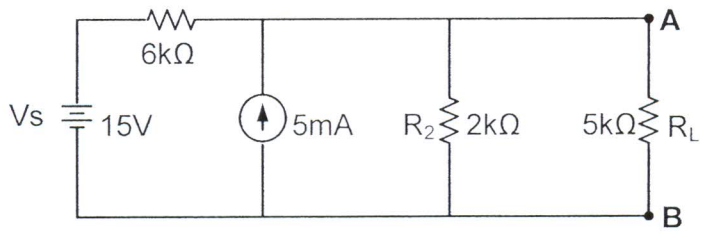


Figure 7

Question 7

Figure 8 show the a.c network, by using the superposition theorem, determine the voltage drop across $\frac{1}{12}F$ capacitor, $V_0(t)$.

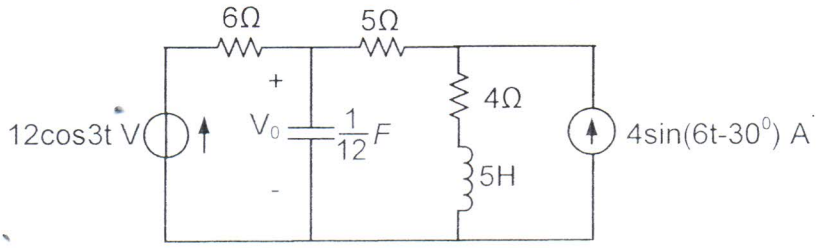


Figure 8

(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 ($\theta=0^0$). 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 shown in **Figure 9,** and hence:

(a) Find the total apparent power, the power factor and magnitude of I_T without capacitance **C** in the system.

(10 marks)

(b) Find the capacitive VARs that must be produced by capacitance **C** to make the power factor of the system equal unity.

2 marks)

(c) Find the capacitance **C** necessary to achieve the power factor in part (ii).

(2 marks)

(d) Find the total power apparent power and total I_T after the power factor correction.

(6 marks)

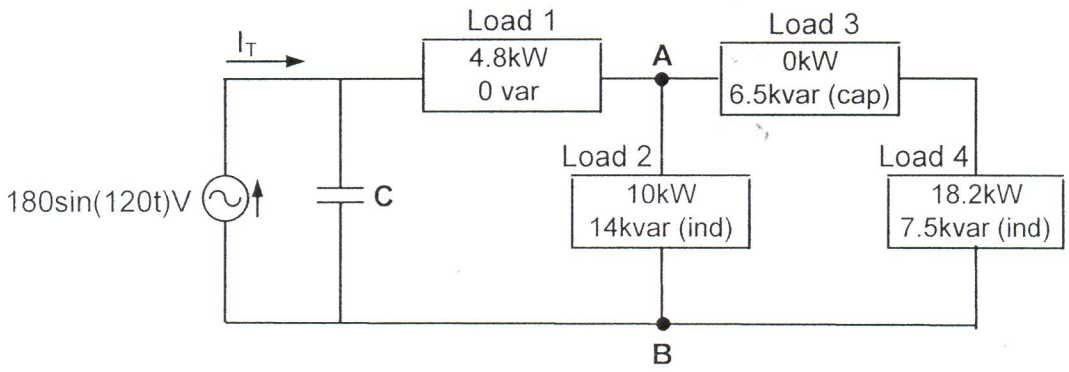


Figure 9

END OF QUESTION PAPER