CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JULY 2010 SESSION

SUBJECT CODE : FED 10502

SUBJECT TITLE : ELECTRICAL TECHNOLOGY

LEVEL : DIPLOMA

TIME / DURATION : 9.00 am – 11.00 am
(2 HOURS)

DATE : 16 NOVEMBER 2010

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. Answers 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 two (2) question only.

6. Answer all questions in English.

THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL question.

Please use the answer booklet provided.

Question 1

(a) Calculate the problem as follows;

    i.   Given ω = 200 rad/s, determine how long it will take the sinusoidal waveform to pass through an angle of 90°.

                                                 (4 marks)

    ii.   Find the angle through which a sinusoidal waveform of 60 Hz will pass in a period of 5 ms.

                                                 (4 marks)

    iii.   Given $i = 6 \times 10^{-3} \sin 1000t$, determine i at t = 2 ms.

                                                 (6 marks)

    iv.   Draws and explains the phase relationship between the sinusoidal waveforms of the following set.

                                                 (6 marks)

$$v = 10 \sin (\omega t + 30°)$$
$$i = 5 \sin (\omega t + 70°)$$

(b) Calculate the value of capacitance C should be used in figure 1, to make the current i have the same phase as the voltage $e(t)$?

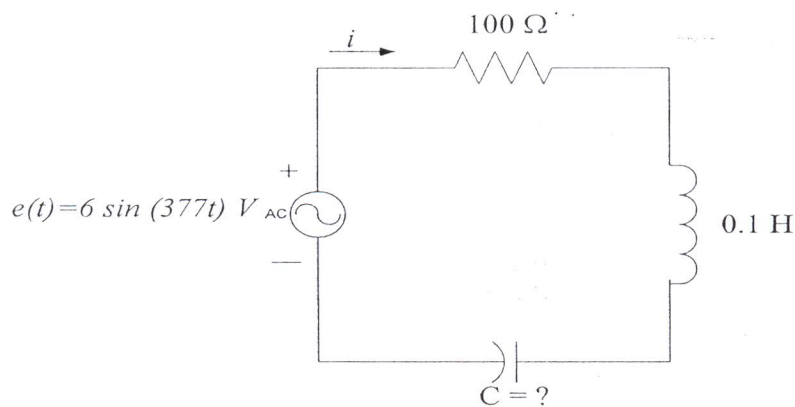

Figure 1

                                                 (10 marks)

Question 2

(a)   Three impedances are connected in series across a 150V, 3.5 kHz supply. The impedances comprise:

Z_1 - an inductance of 0.55mH and 7Ω resistance,

Z_2 - an inductance of 770μH and 8 Ω resistance, and

Z_3 - a capacitor of capacitance 15μF and resistance 7Ω

Assuming that there is no mutual inductive effect between the two inductances, calculate:

i.   the total circuit impedance

(6 marks)

ii. circuit current

(4 marks)

iii. the circuit phase angle

(2 marks)

iv. the voltage across each impedance

(9 marks)

v.   the power dissipated in the circuit

(2 marks)

(b)   A coil of resistance 25 Ω and inductance 100 mH is connected in series with a capacitance of 0.12 μF across a 200 V, variable frequency. Calculate ;

i.   The resonant frequency

(2 marks)

ii. The current at resonance

(2 marks)

iii. The factor by which the voltage across the reactance is greater than the supply voltage. (Q factor)

(3 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.

Please use the answer booklet provided.

Question 3

(a)   Use superposition to find V_0 in the circuit shows in Figure 2;
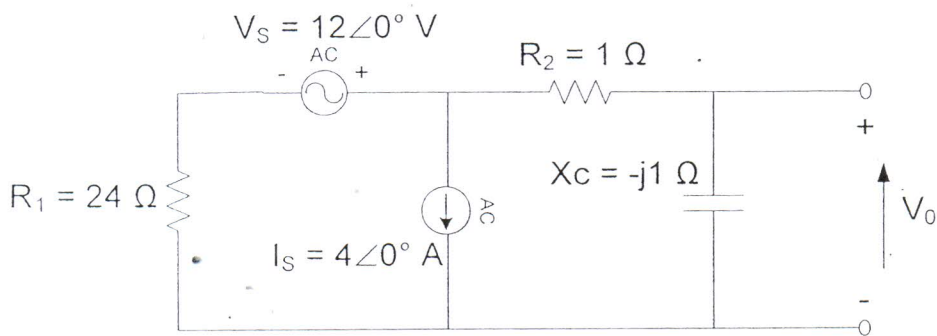
(14 marks)

Figure 2

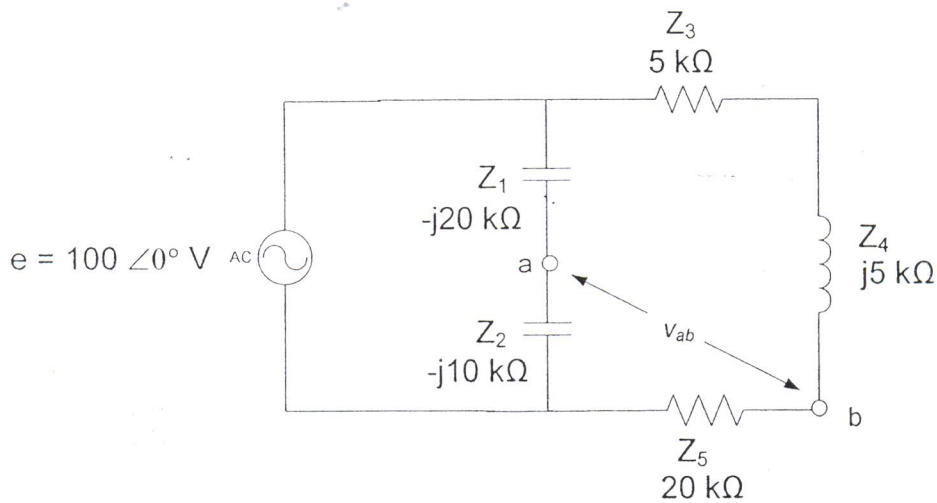(b)   Find the polar form of voltage v_{ab} in Figure 3.

(6 marks)

Figure 3

Question 4

(a)   Refer to Figure 4 and determine the current through the load R_L using Thevenin Theorem.

(10 marks)

R₁
22 kΩ

R₂
22 kΩ

I_L

V_S
$32\angle0°$ V_{AC}
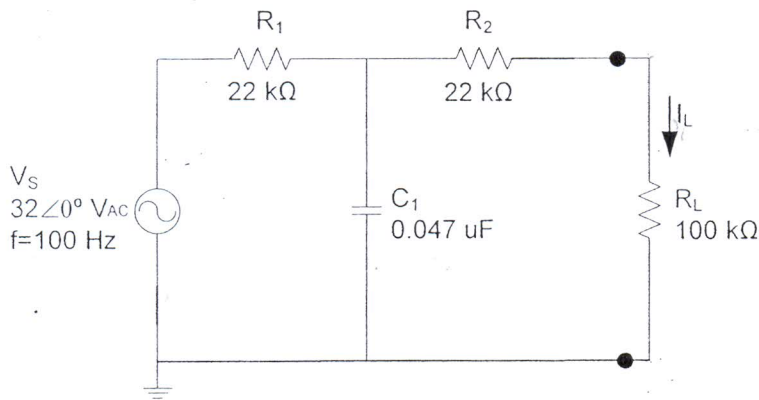f=100 Hz

C_1
0.047 uF

R_L
100 kΩ

Figure 4

(b)   For the power system shown in Figure 5, find:

i.   the total apparent power and the power factor.

(5 marks)
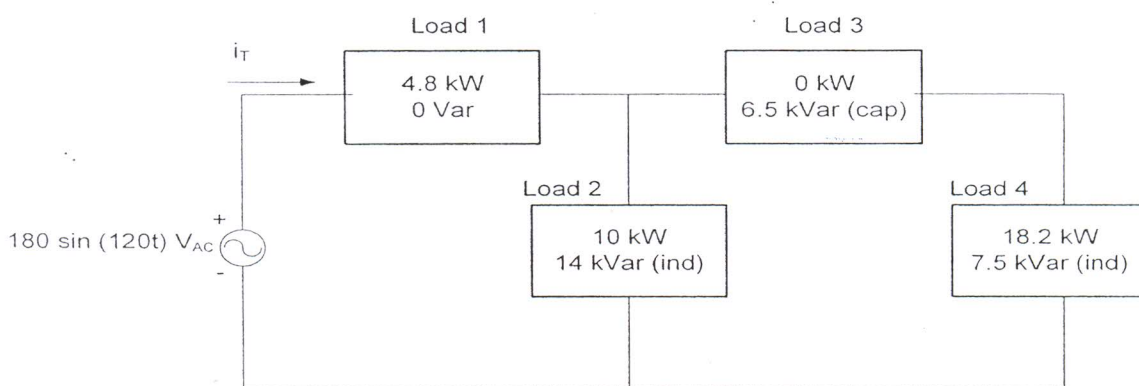
ii.   the total current i_T in polar form.

(5 marks)

Load 1
4.8 kW
0 Var

Load 3
0 kW
6.5 kVar (cap)

Load 2
10 kW
14 kVar (ind)

Load 4
18.2 kW
7.5 kVar (ind)

i_T

180 sin (120t) V_{AC}

Figure 5

Question 5

Figure 6 shows a three phase star-connected load impedances $Z_1 = 20 + j37.7\ \Omega$ per phase are parallel with another connected impedances $Z_2 = 30 - j159.3\ \Omega$. The phase voltage of generator is 398 volts. Determine:

(a)   impedance total per phase

(3 marks)

(b)   load voltage per phase

(3 marks)

(c)   the line current (I_L)

(6 marks)

(d)   the power factor ($\cos \theta$)

(2 marks)

(e)   the active power (W)

(3 marks)

(f)   the reactive power (Var)
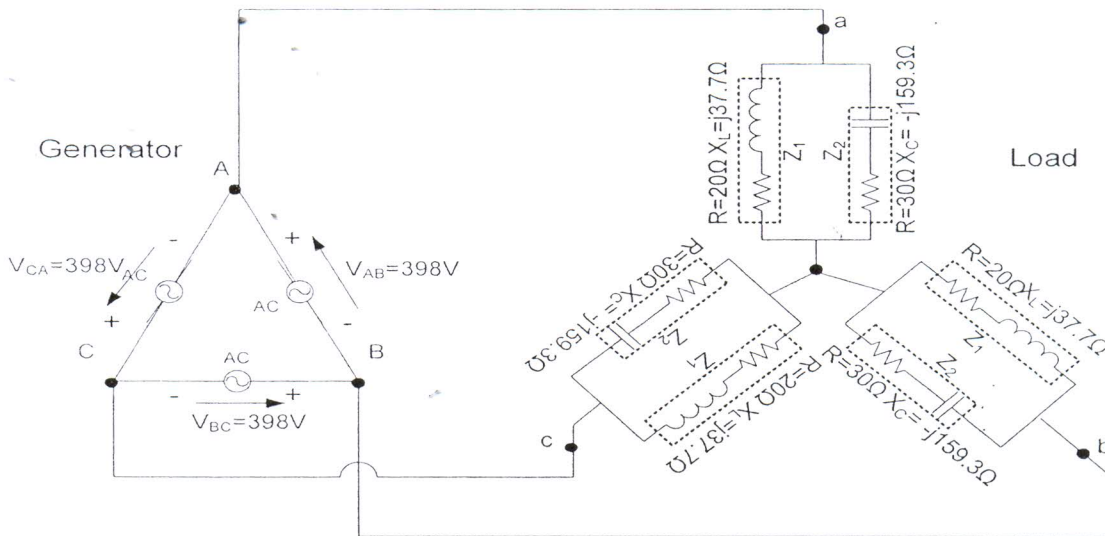
(3 marks)

Figure 6

END OF QUESTION PAPER