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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FED10203**
SUBJECT TITLE	:	**ELECTRICAL TECHNOLOGY**
LEVEL	:	**DIPLOMA**
TIME / DURATION	:	**3.30 PM – 5.30 PM (2.5 HOURS)**
DATE	:	**31 DECEMBER 2014**

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 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE AND APPENDIX.

SECTION A : (Total: 60 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

(a) Calculate the following value of **impedance** and **admittance** at difference frequency.

Element	Frequency	Impedance (Ω)	Admittance (S)
L = 15 mH	35 Hz		
	5 kHz		
C = 40 uF	50 Hz		
	16 kHz		

(8 marks)

(b) Two sinusoidal currents are given by the equations; $i_1 = 10 \sin(\omega t + 60°)$ A and $i_2 = 15 \sin(\omega t - 45°)$ A. Calculate the phase difference between them.

(4 marks)

(c) The voltage in an AC circuit at any time *t* is given by $v(t) = 200 \cos(100\pi t - 55°)$ *V*.
Find :

(i) The peak value (V_P), the peak to peak value (V_{PP}), the periodic time (T), the frequency (f), phase angle (θ) relative to 50 sin (500πt) and draw the signal waveform.

(8 marks)

(ii) The value of the voltage when t = 15ms.

(3 marks)

(iii) The time when the voltage first reaches maximum.

(4 marks)

(iv) The value of current $i_C(t)$ when the above value of voltage across 5 μF capacitor.

(3 marks)

Question 2

(a) Calculate total impedance Z_T in the network at ω = 377 rad/s as in **Figure 1.**

(10 marks)

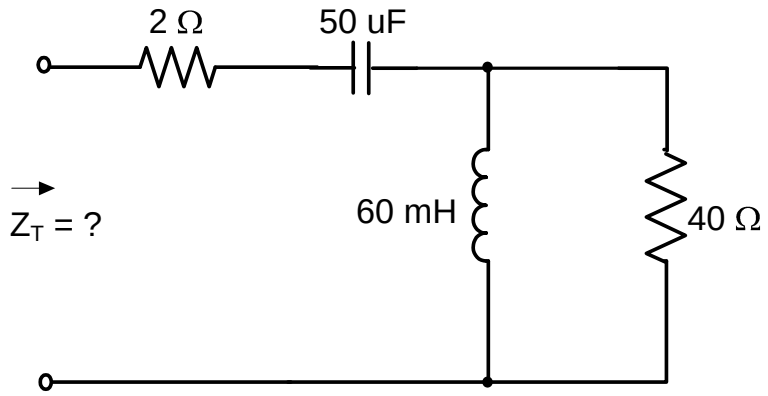

Figure 1

(b) A series connected load in **Figure 2** draws a current i(t) = 4 cos (100πt + 10°) A when the applied voltage is v(t) = 120 cos (100πt - 20°) V. Find the apparent power and the power factor of the load. Determine the element Resistor (R) and Capacitor (C) values that form the series connected load.

(10 marks)

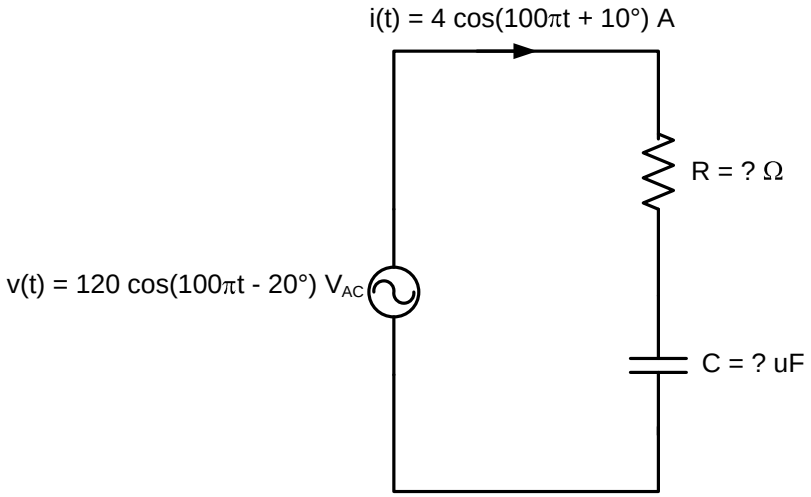

Figure 2

(c) Calculate the reading of the wattmeter in the network of **Figure 3**.

(10 marks)

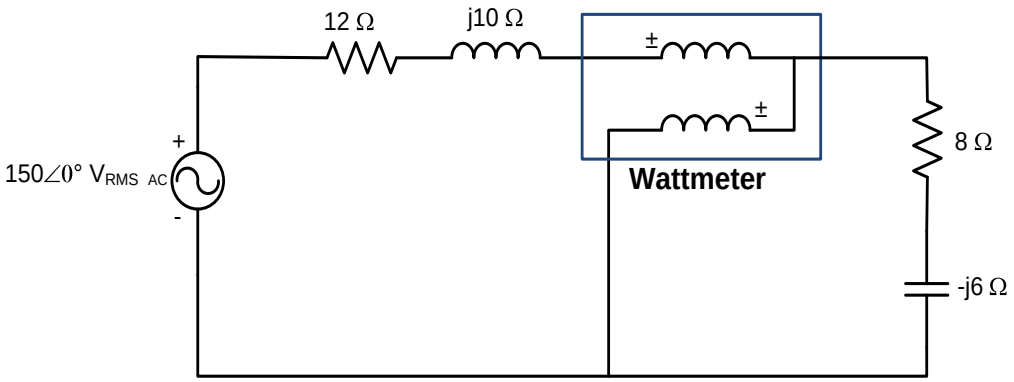

Figure 3

SECTION B : (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.
Please use the answer booklet provided.

Question 3

(a) Calculate the value of voltage V_0 in the circuit as shown in **Figure 4**, by using **superposition** theorem.

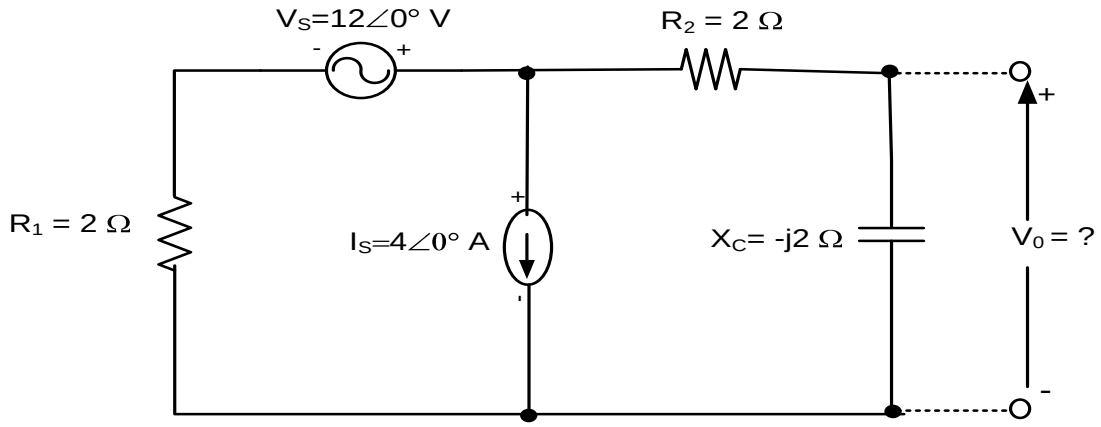

Figure 4

(14 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.

(2 marks)

Question 4

(a) Refer to **Figure 5** and determine the voltage V_0 across the load X_L = j40 Ω using **nodal** analysis.

(8 marks)

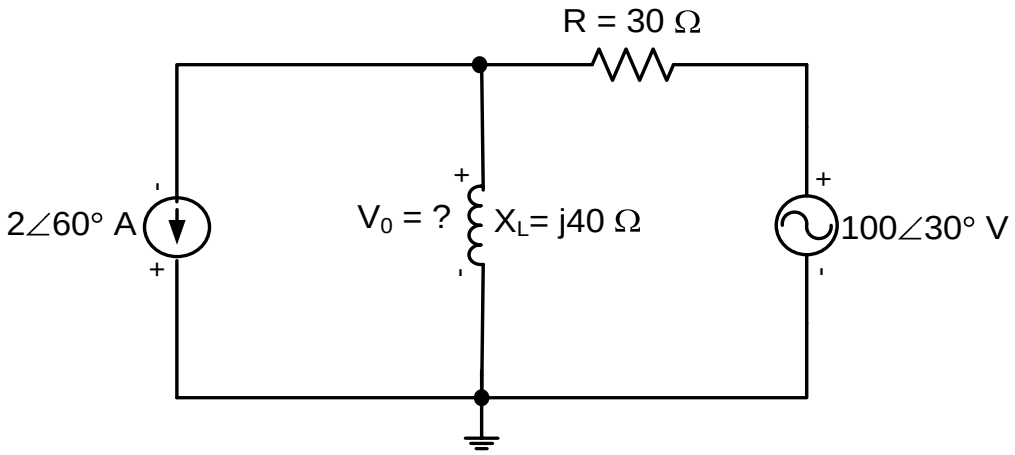

Figure 5

(b) **Figure 6** shows an industrial load through a transmission line that has a line impedance of 0.1 + j0.2 Ω. The 60 Hz line voltage at the load is 480 ∠0° V_{RMS}. The load consumes 124 kW at 0.75 power factor lagging. Determine :

(i) The active (P) and reactive (Q) power losses in the line.

(6 marks)

(ii) The value of capacitance (C) when placed in parallel with the load will change the power factor to 0.9 lagging.

(6 marks)

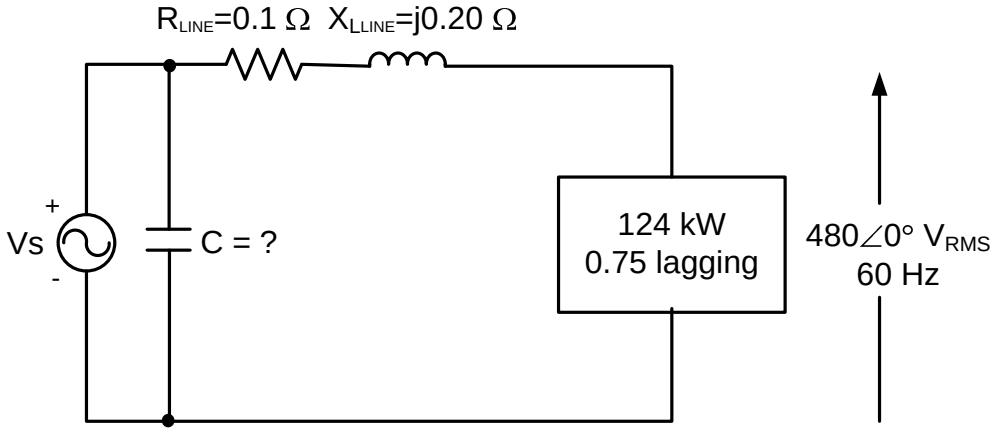

Figure 6

Question 5

(a) Sketch a phasor representation of an "a-b-c" sequence balanced three phase star connected source, including V_{an}, V_{bn} and V_{cn}, if $V_{an} = 120\angle 15° V_{RMS}$.

(6 marks)

(b) In a balanced three phase system, the source has an "a-b-c" phase sequence and is connected in delta. There are two parallel star connected loads as in **Figure 7**. The phase impedance of load 1 (Z_{1Y}) and load 2 (Z_{2Y}) is 4 + j4 Ω and 10 + j4 Ω, respectively. The line impedance (Z_{LINE}) connecting the source to the loads is 0.3 + j0.2 Ω. If the current in the "a" phase of load 1 is $I_{AN1} = 10\angle 20° A_{RMS}$, find the delta currents in the source (I_{ab}, I_{bc} and I_{ca}).

(14 marks)

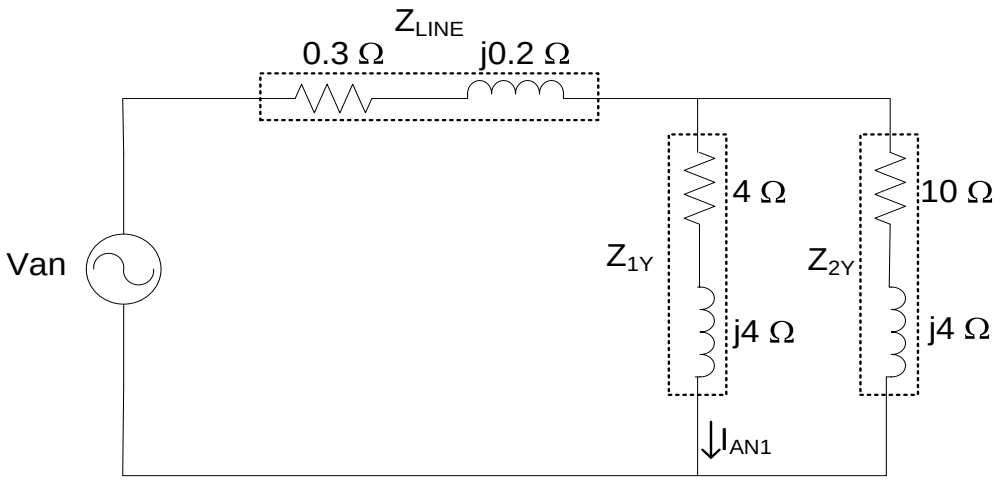

Figure 7

END OF QUESTION PAPER

APPENDIX

$f = \frac{1}{T}$ Hz

$\omega = 2\pi f$ rad/sec

$Z_R = R\angle 0° \ \Omega$

$Z_L = jX_L = jL\omega = L\omega \angle 90° \ \Omega$

$Z_C = -jX_C = \frac{1}{jC\omega} = \frac{1}{C\omega}\angle -90° \ \Omega$

Series circuit : $Z_T = Z_1 + Z_2 + Z_3 + \ldots\ldots + Z_N \ \Omega$

Parallel circuit : $\frac{1}{Z_T} = \frac{1}{Z_1} + \frac{1}{Z_2} + \frac{1}{Z_3} + \ldots\ldots + \frac{1}{Z_N} \ \Omega$

Kirchhoff's current Law : $\sum_{j=1}^{n} i_j \ t \ = 0$

Kirchhoff's voltage Law : $\sum_{j=1}^{n} v_j \ t \ = 0$

Voltage divider rule's : $V_1 \ t \ = \frac{R_1}{R_1 + R_2} \times V_s$

Current divider rule's : $I_1 \ t \ = \frac{R_2}{R_1 + R_2} \times I_s$