UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION
SEPTEMBER 2016 SEMESTER

COURSE CODE	:	LEB20903
COURSE NAME	:	NETWORK ANALYSIS
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	BACHELOR OF ENGINEERING TECHNOLOGY (HONS) IN MARINE ELECTRICAL AND ELECTRONIC
DATE	:	26 JANUARY 2017
TIME	:	09.00 AM – 12.00 PM
DURATION	:	3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please CAREFULLY read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of FIVE (5) questions.
4. Answer FOUR (4) questions ONLY.
5. Please write your answers on the answer booklet provided.
6. Answer all questions in English language ONLY.

THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer FOUR (4) questions ONLY.
Please use the answer booklet provided.

Question 1 (CLO 1)

(a) The most prominent feature of the frequency response of a circuit maybe the sharp peak (or resonant peak) exhibited in its amplitude characteristic. The concept of resonance applies in several areas of science and engineering. Resonance occurs in any system that has a complex conjugate pair of poles; it is the cause of oscillations of stored energy from one form to another. It is the phenomenon that allows frequency discrimination in communications networks. Resonant circuits (series or parallel) are useful for constructing filters, as their transfer functions can be highly frequency selective. They are used in many applications such as selecting the desired stations in radio and TV receivers.

i. State the definition of Resonance that occurs in any circuit that has at least one inductor and one capacitor.

(2 marks) (C3)

ii. Explain **four (4)** characteristics at resonance in term of impedance, power factor, magnitude of the transfer function and relationship between inductor voltage and capacitor voltage toward the source voltage.

(8 marks)(C3)

(b) In the circuit of Figure 1, given that R = 2Ω, L = 1 mH and C = 0.4 μF.

i. Calculate the resonant frequency and the half-power frequencies.

(5 marks) (C3)

ii. Determine the quality factor and bandwidth.

(4 marks) (C4)

iii. Evaluate the amplitude of the current at the resonant frequency and half-power frequencies.

(6 marks) (C5)

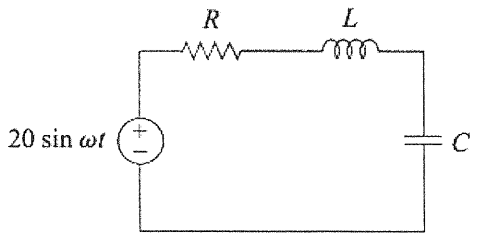

Figure 1

Question 2 (CLO 1)

(a) The parallel RLC circuit in Figure 2 is the dual of the series RLC circuit. Identify the admittance for the circuit.

(4 marks)(C3)

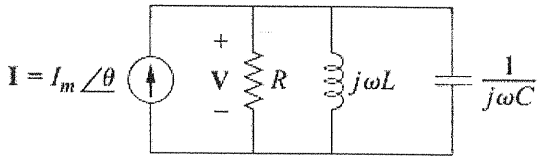

Figure 2

(b) Explain the quality factor of a resonant circuit and a filter.

(6 marks)(C3)

(c) In the circuit of Figure 3, given that R = 8kΩ, L = 0.2 mH and C = 8 μF.

i. Calculate the resonant frequency, quality factor and bandwidth.

(6 marks) (C3)

ii. Determine the half-power frequencies.

(2 marks) (C4)

iii. Evaluate the power dissipated at the resonant frequency and half-power frequencies.

(7 marks) (C5)

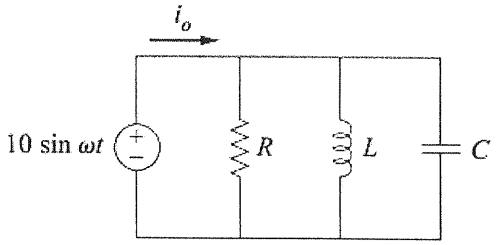

Figure 3

Question 3 (CLO 2)

(a) A source-free RC circuit occurs when the dc source is suddenly disconnected. The energy already stored in the capacitor is released to the resistors. Consider a series combination of a resistor and an initially charged capacitor, as shown in Figure 4, identify the circuit response, $v_c(t)$. Assume that at time t = 0 s, the initial voltage is $v_c(0)=v0$..

(10 marks)(C3)

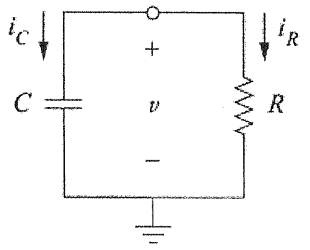

Figure 4

(b) The natural response of a circuit refers to the behavior (in terms of voltages and currents) of the circuit itself, with no external sources of excitation. The natural response depends on the nature of the circuit alone, with no external sources. In fact, the circuit has a response only because of the energy initially stored in the capacitor. When a circuit contains a single capacitor and several resistors and dependent sources, the Thevenin equivalent can be found at the terminals of the capacitor to form a simple RC circuit. Also, one can use Thevenin's theorem when several capacitors can be combined to form a single equivalent capacitor. In the circuit of Figure 5, let $v_c(0)$ = 15 V.

i. Calculate the equivalent resistance, R_{eq}.

(2 marks)(C3)

ii. Determine $v_c(t)$ and $v_x(t)$ for t > 0 s.

(8 marks)(C4)

iii. Evaluate the current, $i_x(t)$ for t > 0 s.

(5 marks)(C5)

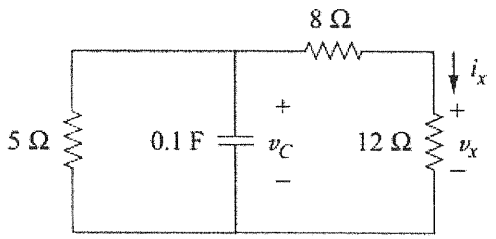

Figure 5

Question 4 (CLO 2)

(a) Consider the series connection of a resistor and an inductor, as shown in Figure 6. Identify the circuit response, which the current, i(t) through the inductor. Select the inductor current as the response in order to take advantage of the idea that the inductor current cannot change instantaneously. At t = 0 s, assume that the inductor has an initial current, I_0.

(10 marks)(C3)

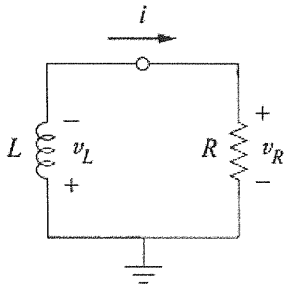

Figure 6

(b) When a circuit has a single inductor and several resistors and dependent sources, the Thevenin equivalent can be found at the terminals of the inductor to form a simple RL circuit. Also, one can use Thevenin's theorem when several inductors can be combined to form a single equivalent inductor. In the circuit of Figure 7, let i(0) = 10 A, evaluate the current, i(t) and $i_x(t)$

(15 marks)(C5)

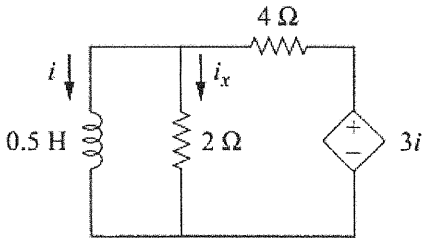

Figure 7

Question 5 (CLO 3)

(a) Describe a two-port network with an example.

(5 marks)(C3)

(b) Identify **four (4)** difference ways of combining the four variables

(5 marks)(C3)

(c) Figure 8 shows a circuit of Z parameter. Analyze the circuit and evaluate the Z parameter.

(15 marks)(C5)

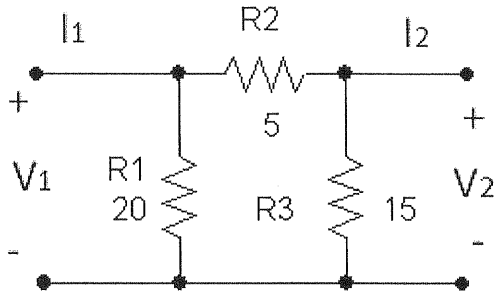

Figure 8

END OF EXAMINATION PAPER