الجامعة الإسلامية العالمية ماليزيا

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

END OF SEMESTER EXAMINATION
SEMESTER I, 2012/2013 SESSION
KULLIYYAH OF ENGINEERING

Programme : Engineering Level of Study: UG 1

Time : 2:30p.m.-5:30p.m. Date : 29/12/2012

Duration : 3Hrs

Course Code : ECE 1311 Section(s) : ALL

Course Title : **Electric Circuits**

This question paper consists of six (6) printed pages (including a coverpage) with **five** (5) questions.

INSTRUCTION(S) TO CANDIDATES

DO NOT OPEN UNTIL YOU ARE INSTRUCTED TO DO SO

- **You are required to write down all your working steps in a clear manner.**
- Write your answers in the answer sheet provided.
- The total mark for this examination is **100**.
- This examination is worth **50%** of the total assessment.
- You may use **2B pencil or any pencil of equivalent shades of grey** for drawing or sketching purposes.
- Answer **ALL QUESTIONS**.

Any form of cheating or attempt to cheat is a serious offence which may lead to dismissal.

Q.1 [20 marks]

(a)

i. Find the current $i(t)$ flowing through a device if the charge flow is given by

$$q(t) = 5 \sin 40t \text{ C} \qquad \textbf{(3 marks)}$$

ii. The current flowing through an element is shown in **Fig. 1(a)**. Determine the total charge flowing through the element at $t = 10$ ms. **(5 marks)**

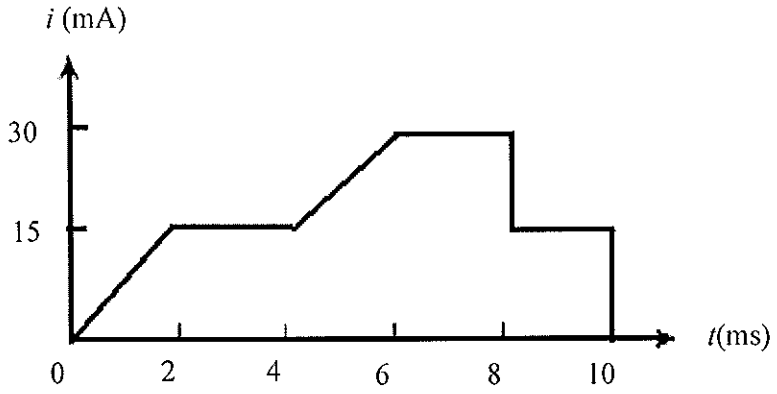

Fig. 1(a)

(b) Consider a circuit shown in **Fig. 1(b)**.

i. Find the equivalent resistance and conductance seen by the source. **(4 marks)**

ii. Find the overall total dissipated power. **(3 marks)**

iii. Find i_1 and v_1 using current division rule and voltage division rule respectively. **(5 marks)**

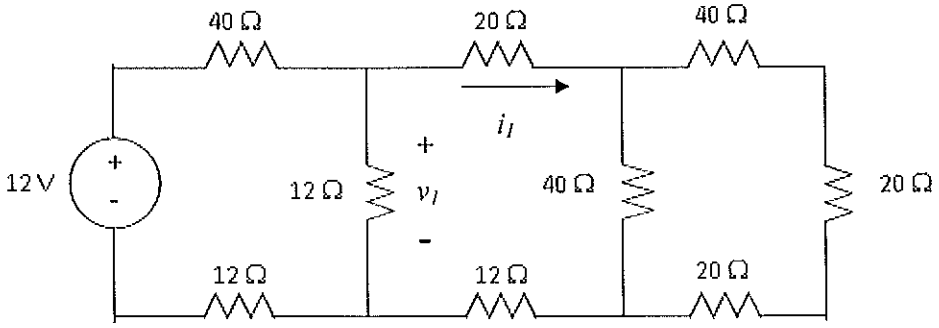

Fig. 1(b)

Q.2 [20 marks]

(a) Use mesh analysis to determine i_1, i_2 and i_3 for the circuit in **Fig. 2(a)**. **(8 marks)**

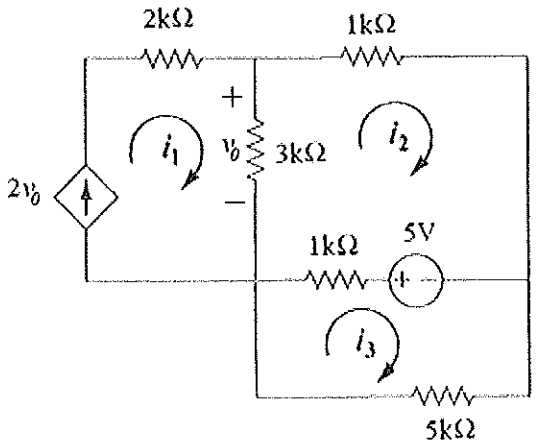

Fig. 2(a)

(b) Use nodal analysis to calculate the voltage across the 2Ω resistor for the circuit in **Fig. 2(b)**. **(12 marks)**

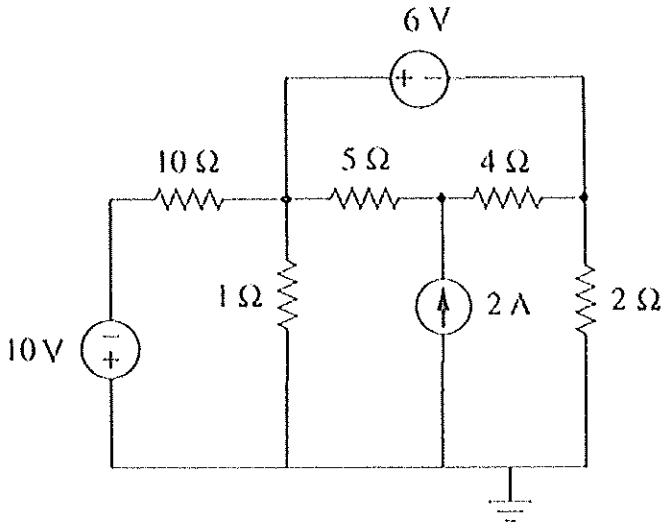

Fig. 2(b)

Q.3 [20 marks]

(a) Use superposition principle to find v_x in the circuit of **Fig. 3(a)**. **(8 marks)**

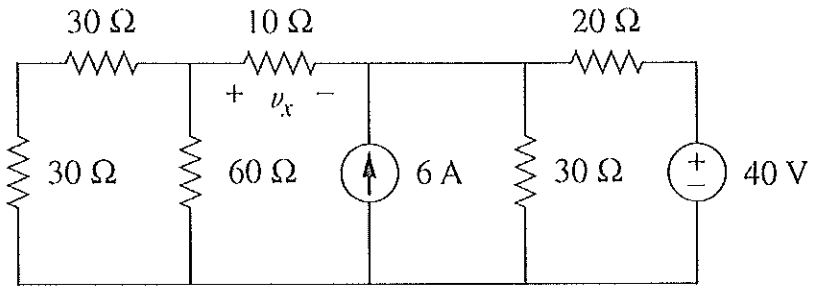

Fig. 3(a)

(b) For the circuit in **Fig. 3(b)**, determine the Norton's equivalent at terminals a-b. Then, (i) find R_L for maximum power deliverable to R_L and (ii) determine the maximum power. **(12 marks)**

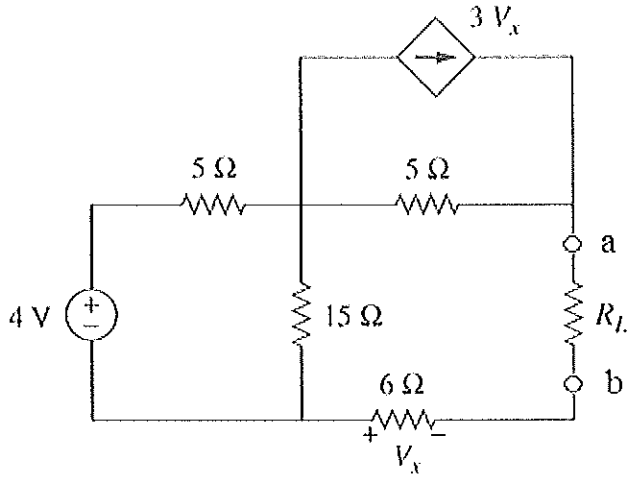

Fig. 3(b)

Q.4 [20 marks]

(a) Draw the circuit shown in **Fig. 4(a)** under DC conditions. Find out the voltage across the capacitor and the current through the inductor. Also, find the energy stored in the inductor and the capacitor. **(8 marks)**

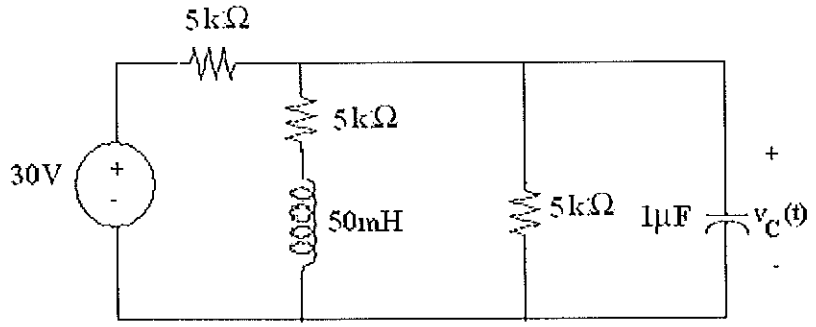

Fig. 4(a)

(b) Find the input impedance, Z_{in}, of the circuit shown in **Fig. 4(b)**. Calculate the input current I and I_1 if $V_s = 50\cos(\omega t + 60°)$ V, and find the phase difference between the two currents. **(12 marks)**

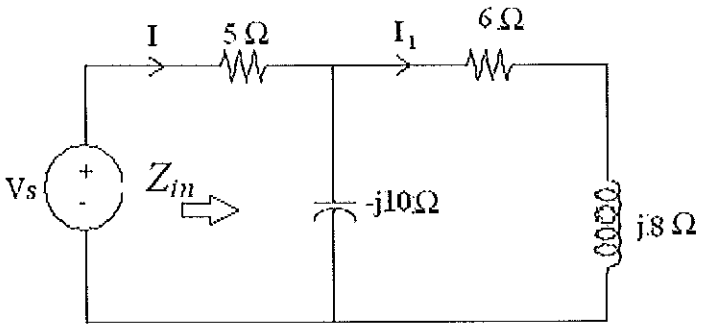

Fig. 4(b)

Q.5 [20 marks]

(a) Use source transformation to find V in **Fig. 5(a)** if $v_1(t) = 120\cos(\omega t - 15°)V$, $i(t) = 6\sin(\omega t + 30°)A$, and $\omega = 100\, rads^{-1}$. **(8 marks)**

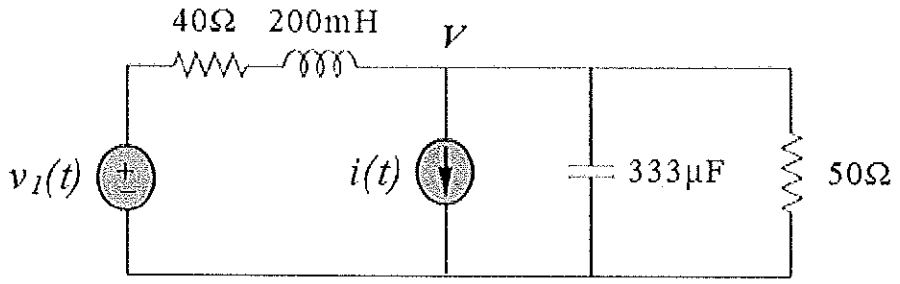

Fig. 5(a)

(b) For the circuit in **Fig. 5(b)**, obtain:

i. The complex power and apparent power of the source. **(6 marks)**

ii. The real power and reactive power of the source. **(4 marks)**

iii. The power factor of the source and specify whether it is leading or lagging. **(2 marks)**

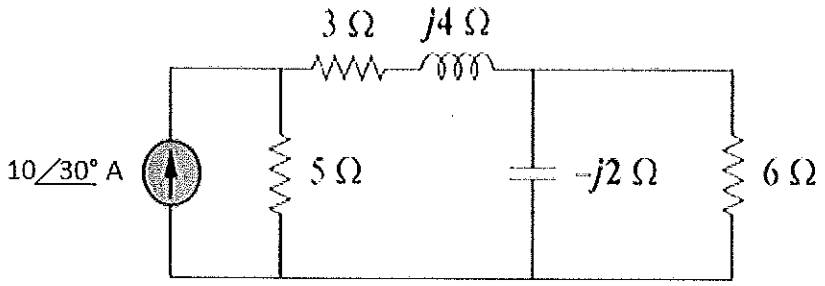

Fig. 5(b)