INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

END-OF-SEMESTER EXAMINATION
SEMESTER II, 2013/2014 SESSION
KULLIYYAH OF ENGINEERING

This Question Paper Consists of **FIVE (5)** Printed Pages (Including Cover Page) with **FIVE (5)** Questions.

INSTRUCTION(S) TO CANDIDATES

DO NOT OPEN UNTIL YOU ARE ASKED TO DO SO

- Total mark of this examination is **100**.
- This examination is worth **50%** of the total assessment.
- Answer all **FIVE (5)** questions. All questions carry equal marks.

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

Question 1 [20 marks]

(a) The current flowing distribution through a device over 12 seconds of time is as shown in Fig. 1a. Find the charge flowing through the device over the interval 0-12 seconds.
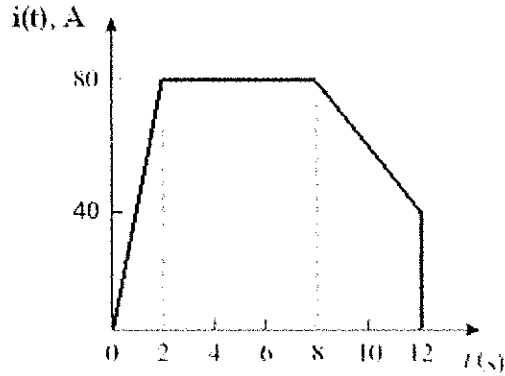
(4 marks)

Fig. 1(a)

(b) Find the energy consumed by the device over a period of 12 hours, assuming its power rating is as shown in Fig. 1(b).
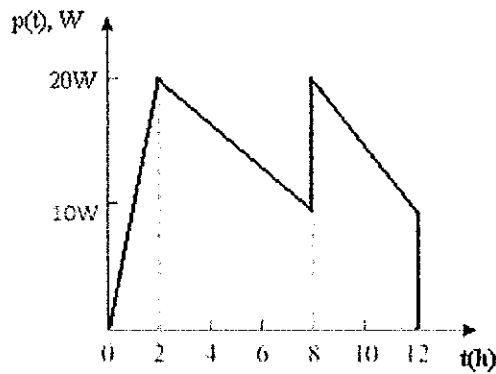
(4 marks)

Fig. 1(b)

(c) Use current division to find the current i_x in the circuit shown in Fig. 1(c).   (6 marks)
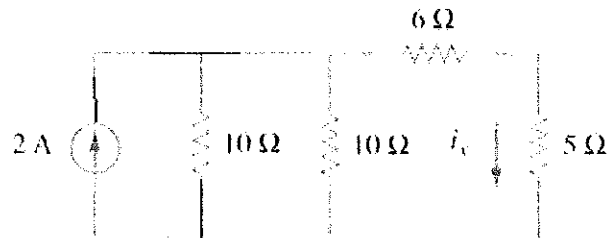

Fig. 1(c)

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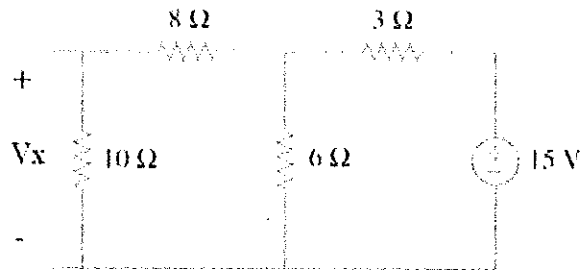**(d)** Use voltage division to find the voltage V_x in the circuit shown in **Fig. 1 (d)**.   **(6 marks)**

Fig. 1(d)

Question 2 [20 marks]

(a) Use nodal analysis to find v_1, v_2 and v_3 in the circuit of **Fig. 2(a)**.   **(10 marks)**
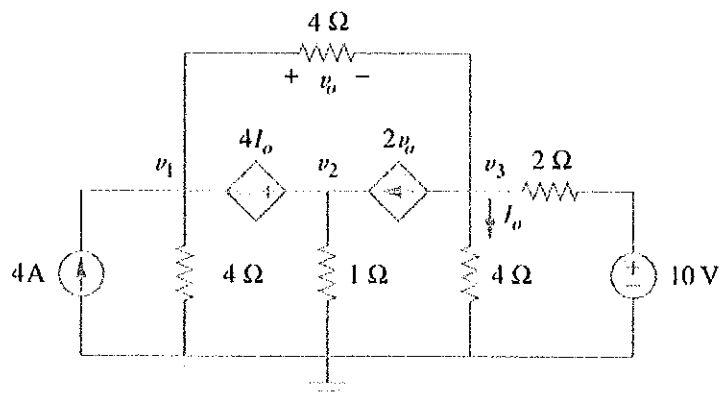

Fig. 2(a)

(b) Find and draw the Thevenin's and Norton's equivalents looking into terminals *a-b* of the circuit shown in **Fig. 2(b)**. What value of the resistor connected across terminals *a-b* will absorb maximum power from the circuit? Also determine the maximum power.
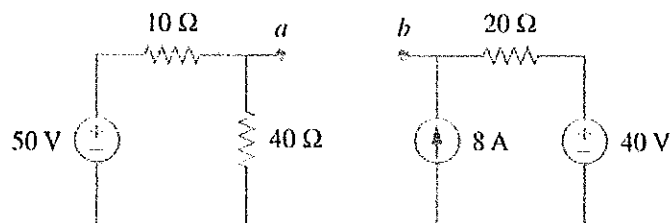
(10 marks)

Fig. 2(b)

Question 3 [20 marks]

(a) Find v_C, i_L, and the energy stored in the capacitor and inductor in the circuit of Fig. 3(a) under dc, steady-state conditions. **(10 marks)**
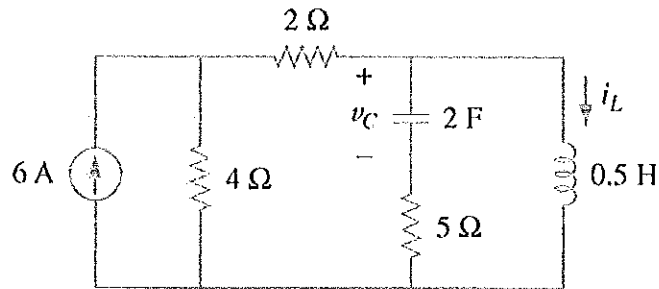

Fig. 3(a)

(b) For the following pairs of sinusoids, determine which one leads and by how much? **(5 marks)**

$$v_1(t) = 50 \cos(112t + 10°) \text{ and } v_2(t) = -20 \cos112t$$

(c) A parallel *RLC* circuit has the node equation

$$\frac{dv}{dt} + 50v + 100 \int vdt = 110\cos(377t - 10°)$$

Determine $v(t)$. You may assume that the value of the integral at $t = -\infty$ is zero. **(5 marks)**

Question 4 [20 marks]

(a) In the circuit of **Fig. 4(a)**, find equivalent impedance (Z_{eq}) at the terminals a-b. Assume $\omega=20$ rad/s. **(10 marks)**
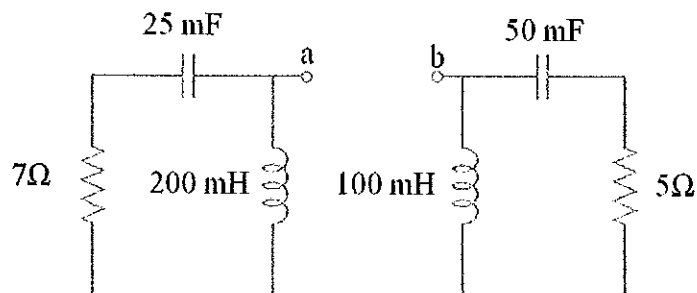

Fig. 4(a)

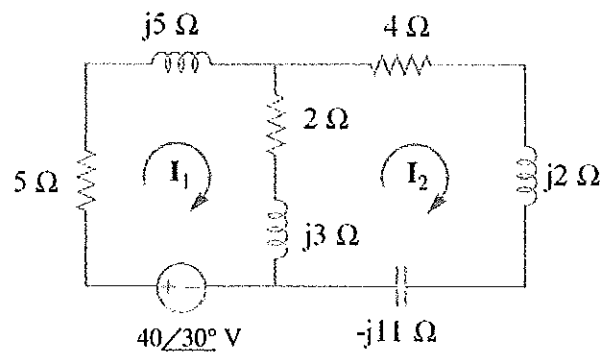**(b)** Using mesh analysis, find I_1 and I_2 in the circuit of **Fig. 4(b)**.   **(10 marks)**

Fig. 4(b)

Question 5 [20 marks]

(a) Determine v_0 in the circuit of **Fig. 5a** using superposition.   **(10 marks)**
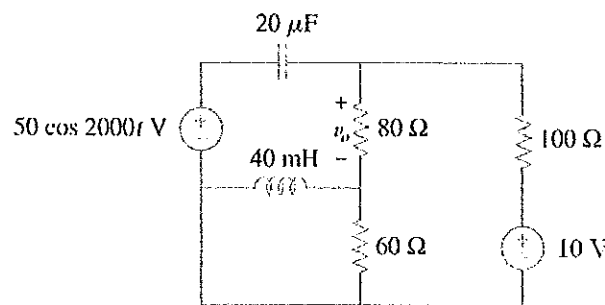

Fig. 5(a)

(b) For the circuit of **Fig. 5(b)**, calculate: **(10 marks)**
   i.   The power factor. State whether it is leading or lagging.
   ii. The average power delivered by the source
   iii. The reactive power
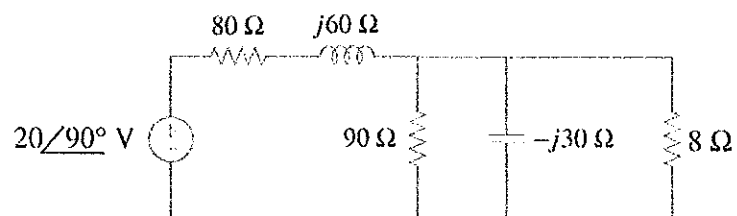   iv. The apparent power
   v.   The complex power

Fig. 5(b)