

الجامعة الإسلامية العالمية ماليزيا

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

END OF SEMESTER EXAMINATION

SEMESTER 2, 2013/2014 SESSION

KULLIYAH OF ENGINEERING

Programme : Engineering Level of Study: UG 1
Time : 2:30p.m.-5:30p.m. Date : 30/05/2013
Duration : 3 Hrs
Course Code : ECE 1311 Section(s) : ALL
Course Title : **Electric Circuits**

This question paper consists of six (7) 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) In the following questions, give the appropriate answer. (10 marks)

- i. Resistivity of a wire depends on
 (a) Length (b) Material (c) Cross section area (d) None
- ii. Ampere second could be the unit of
 (a) Power (b) Conductance (c) Energy (d) Charge
- iii. Two $1\text{ k}\Omega$ resistors with power rating $1/2\text{ W}$ are connected in series. Their combined resistance value and wattage will be
 (a) $2\text{ k}\Omega$, $1/2\text{ W}$ (b) $2\text{ k}\Omega$, 1 W (c) $1\text{ k}\Omega$, $1/2\text{ W}$ (d) $2\text{ k}\Omega$, 2 W
- iv. The current I_0 of Fig. 1.1(a) is _____ (A)

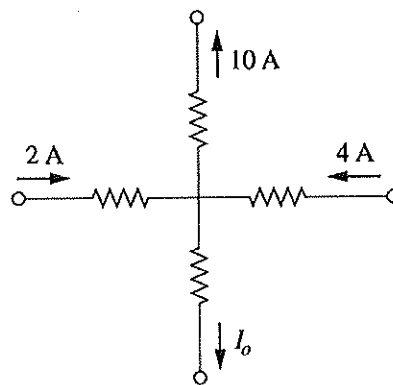


Fig. 1.1(a)

v. In the circuit of Fig. 1.2(a), V_0 is _____ (V)

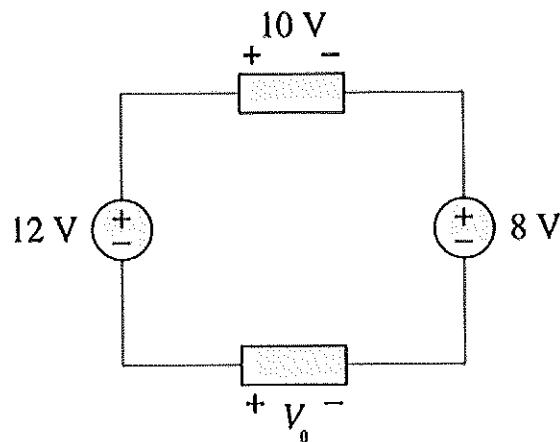


Fig 1.2(a)

(b) A flashlight battery has a rating of 0.8 ampere-hours (Ah) and a lifetime of 10 hours. **(6 marks)**

- i. How much current can it deliver?
- ii. How much power can it give if its terminal voltage is 6 V?
- iii. How much energy is stored in the battery in kWh?

(c) Three light bulbs are connected in series to a 100-V battery as shown in Fig. 1(c). Find the: **(4 marks)**

- i. Current I through the bulbs.
- ii. Resistance of each lamp.

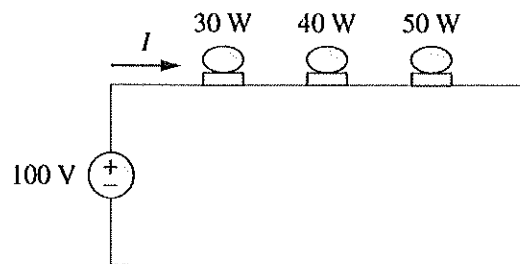


Fig. 1(c)

Q.2 [20 marks]

- (a) Determine voltages v_1 through v_3 in the circuit of **Fig. 2(a)** using nodal analysis. (10 marks)

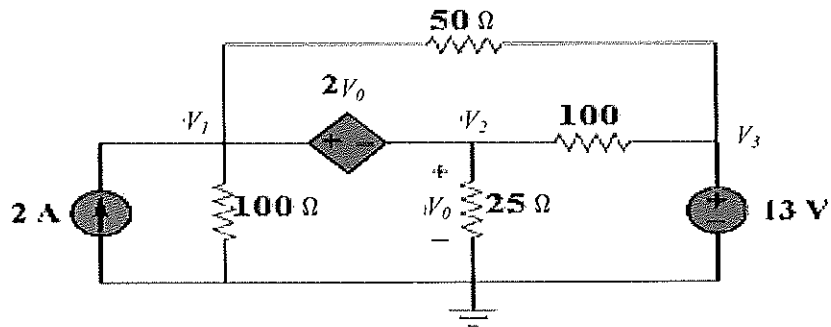


Fig. 2(a)

- (b) Solve the value of v_x of the circuit shown in **Fig. 2(b)** by using the source transformation. (10 marks)

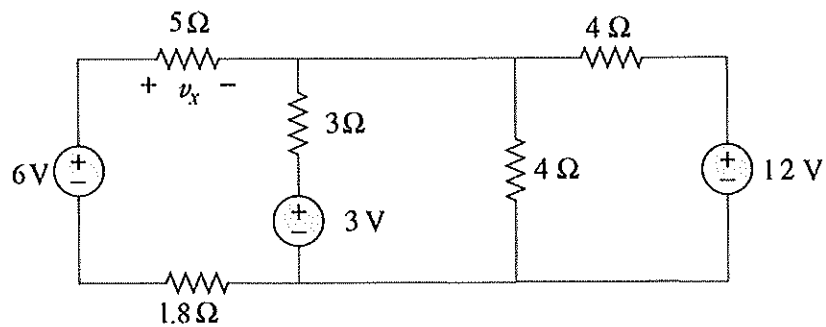


Fig. 2(b)

Q.3 [20 marks]

- (a) Determine the voltage across each capacitor and energy stored at $4\mu\text{F}$ capacitor in the circuit of Fig. 3(a). **(6 marks)**

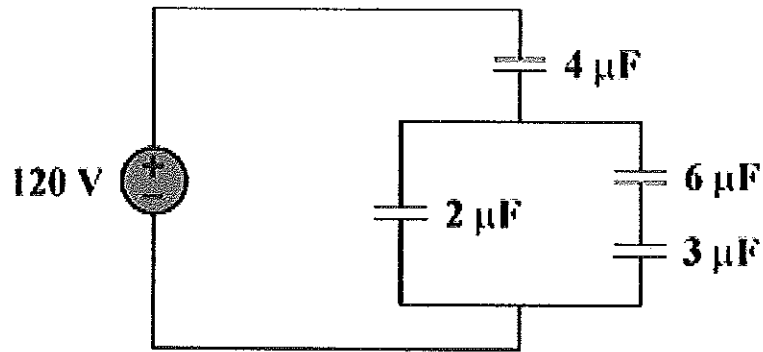


Fig. 3(a)

- (b) Find the current that flows through a 10H inductor when the voltage across it is $20(1-e^{-2t})\text{V}$ and the initial $i(0)$ current through the inductor is 0.3A . Then, find the energy stored in the inductor at $t=1\text{s}$. **(7 marks)**

- (c) For a circuit in Fig. 3(c), determine the value of v_c , v_l and energy stored by the inductor and capacitor under dc conditions. **(7 marks)**

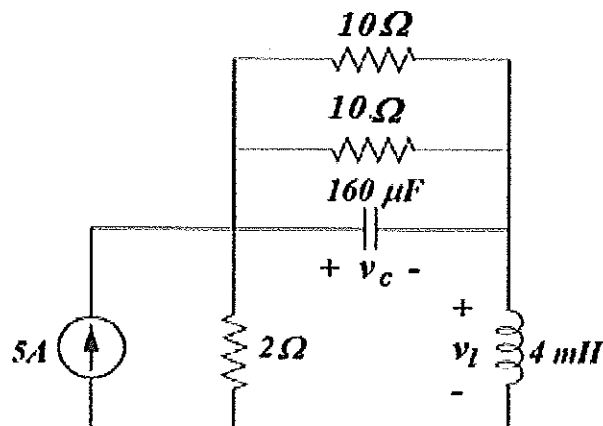


Fig. 3(c)

Q.4 [20 marks]

- (a) Given
- $v(t)$
- and
- $i(t)$
- as follows,

$$v(t) = 4 \cos(4t + 30)$$

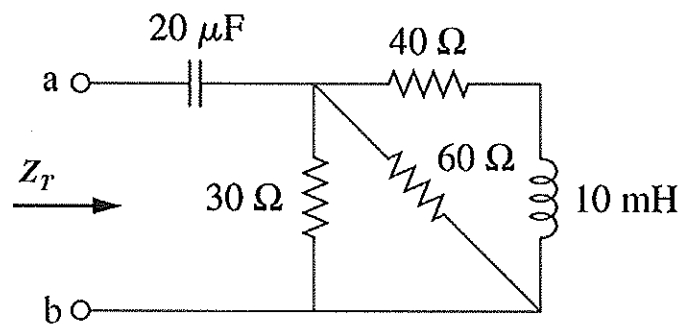
$$i(t) = -10 \sin(4t)$$

Determine:

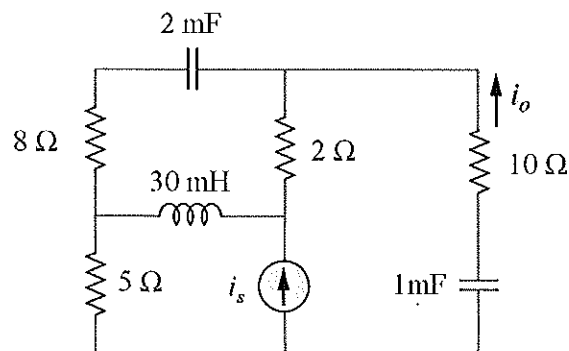
(3 marks)

- The phase angle between the two sinusoids
- Which one leads the other?

- (b) Find the total impedance (
- Z_T
-) in the circuit of
- Fig. 4(b)**
- looking at terminals a-b. Note that
- $\omega = 1000$
- rad/s.
- (7 marks)**

**Fig. 4(b)**

- (c) Solve for
- i_o
- in the circuit of
- Fig. 4(c)**
- using mesh analysis. Note that
- $i_s = 20 \sin(100t + 30)$
- A.
- (10 marks)**

**Fig. 4(c)**

Q.5 [20 marks]

- (a) Using source transformation, find out I_1 and I_2 in the circuit of **Fig. 5(a)**. Also, find out V_{TH} between points 'a' and 'b'. **(6 marks)**

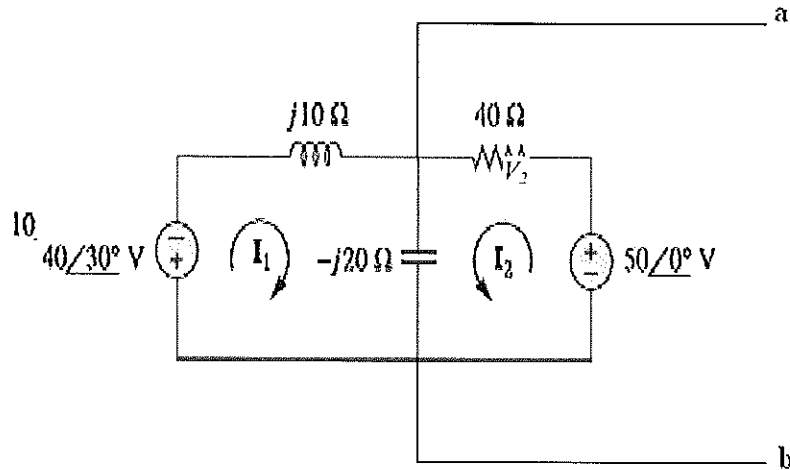
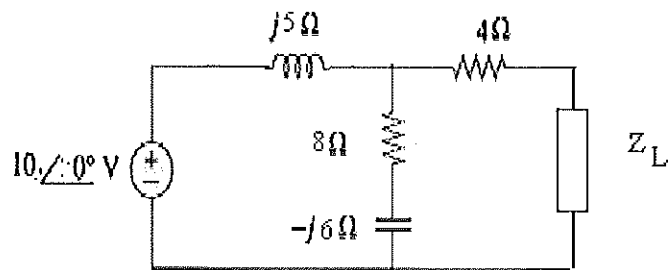


Fig. 5(a)

- (b) For the circuit in **Fig. 5(b)**, under maximum power transfer condition, determine:

- i. The load Z_L and V_{TH} . **(4 marks)**
- ii. The average power delivered to the load Z_L . **(2 marks)**
- iii. The real power and reactive power of the load Z_L . **(4 marks)**
- iv. The power factor of the load Z_L and specify whether it is leading or lagging. **(4 marks)**



Q5(b)

Fig. 5(b)