UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2011/2012

COURSE NAME	:	ELECTRIC CIRCUITS / ELECTRICAL CIRCUIT THEORY
COURSE CODE	:	BEL 10103 / BEX 10103 / BEE 1113
PROGRAMME	:	BEB / BEE
EXAMINATION DATE	:	JUNE 2012
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY.

THIS PAPER CONSISTS OF **NINE** (9) PAGES

Q1 (a) The motion of the positive charge and negative charge can actually create several types of currents; that is, charge can vary with time in several ways. The two common types of current are the direct current (dc) and alternating current (ac). Explain with the aid of diagrams the difference between these two current.

(4 marks)

(b) The charge entering the positive terminal of an element is shown in **Figure Q1(b)** and the voltage across the element is $v(t) = 5 - di/dt$ V. Find the total energy absorbed by the device for the period of $0 < t < 8$ s.

(10 marks)

(c) Simplify the circuit in **Figure Q1(c)** to find R_{ab} and use the voltage division principle to calculate current, i and voltage, v.

(6 marks)

Q2 (a) Consider the circuit in **Figure Q2(a)**,

(i) Would you use the nodal or mesh analysis to find the power absorbed by 20 V source? Explain your choice.

(2 marks)

(ii) Use the method you prefer in part Q2(a)(i) to find the power.

(12 marks)

(b) Find the current, i_o in the 5 kΩ resistor in the circuit of **Figure Q2(b)** by making a succession of appropriate source transformations.

(6 marks)

Q3 (a) For the circuit in **Figure Q3(a)**, determine the value of R such that the maximum power delivered to the load, R_L, is 3 mW.

(7 marks)

(b) Apply the Superposition theorem to the network in **Figure Q3(b)** to determine the value of voltage across the 4 Ω resistor, v.

(13 marks)

Q4 (a) Fine the Mesh-currents, i_1, i_2 and i_3 in the network of **Figure Q4(a)**.

(8 marks)

(b) Convert the circuit in **Figure Q4(b)** into the Thevenin equivalent circuit as seen from terminals:

(i) *a-b*

(6 marks)

(ii) *b-c*

(6 marks)

Q5 (a) The voltage across a 5 mH inductor has the waveform shown in **Figure Q5(a)**. Calculate and draw the waveform for the inductor current. Assume $i(0) = 0$ A.

(11 marks)

(b) Draw the Norton equivalent circuit at the terminals *a-b* for the circuit in **Figure Q5(b)**.

(9 marks)

Q6 (a) For the network in **Figure Q6(a)**, the switch has been at position A for a long time and moved to position B at $t = 0$. Determine $i(t)$, $v_1(t)$ and $v_2(t)$ for $t > 0$.

(11 marks)

(b) The switch in the circuit shown in **Figure Q6(b)** has been opened for a long time. At $t = 0$, the switch is closed.

(i) Calculate the initial value and the final value of $i(t)$ and $v(t)$.

(4 marks)

(ii) Find the time constant, τ for $t \geq 0$. State the complete numerical expression for $i(t)$ and $v(t)$ when $t \geq 0$.

(5 marks)

Q7 (a) In the circuit shown in **Figure Q7(a)**, $v_o = 0$ and $I_o = -12.25$ mA.

(i) Find the roots of the characteristic equation. Determine the type of response.

(5 marks)

(ii) Calculate $v(t)$ and dv/dt at $t = 0^+$. State the complete voltage response, $v(t)$ for $t \geq 0$.

(5 marks)

(b) The switch in the circuit of **Figure Q7(b)** has been at position *A* for a long time. At $t = 0$, the switch moved to position *B*. Determine the complete response of $v(t)$ for $t > 0$.

(10 marks)

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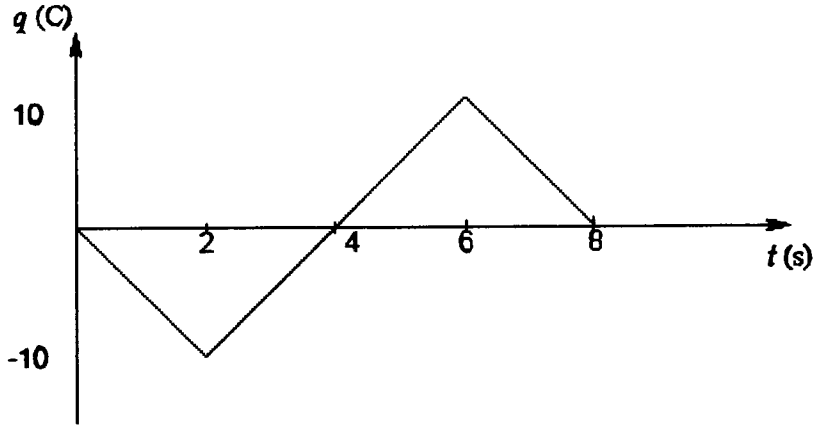

FIGURE Q1(b)

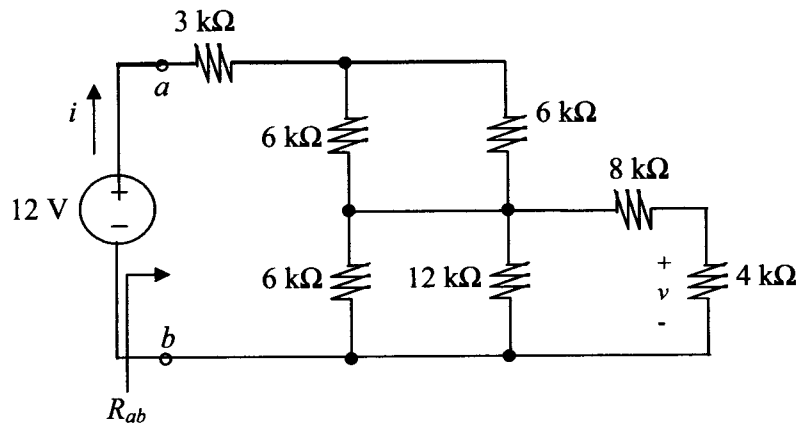

FIGURE Q1(c)

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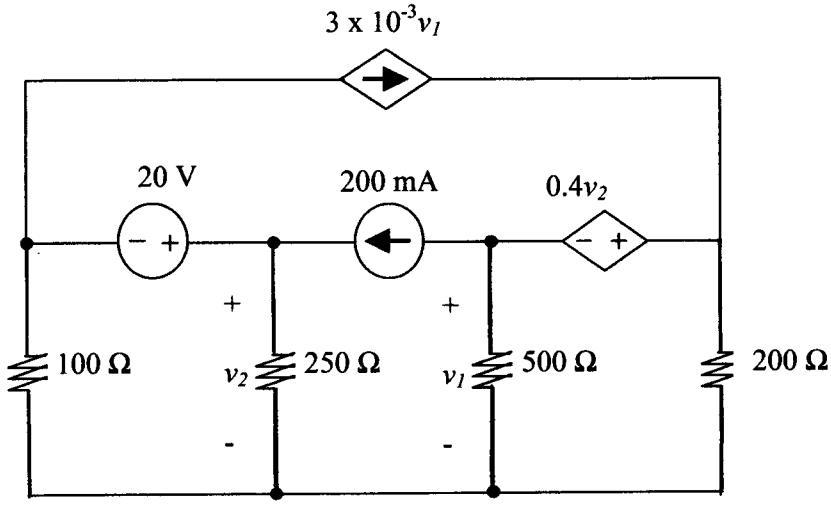

FIGURE Q2(a)

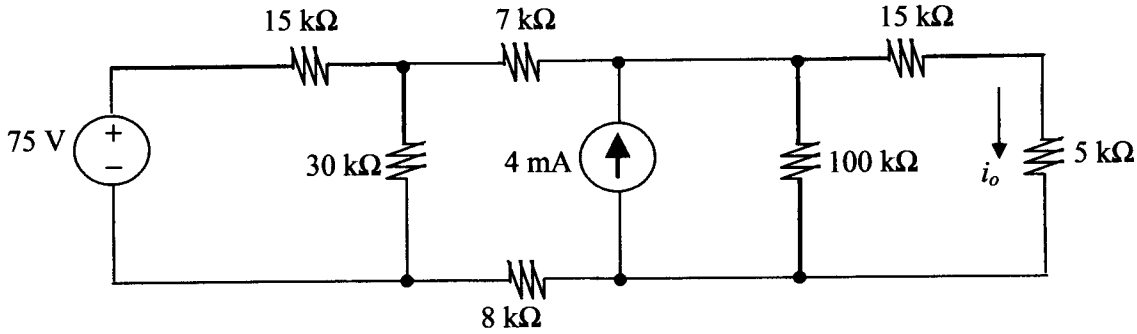

FIGURE Q2(b)

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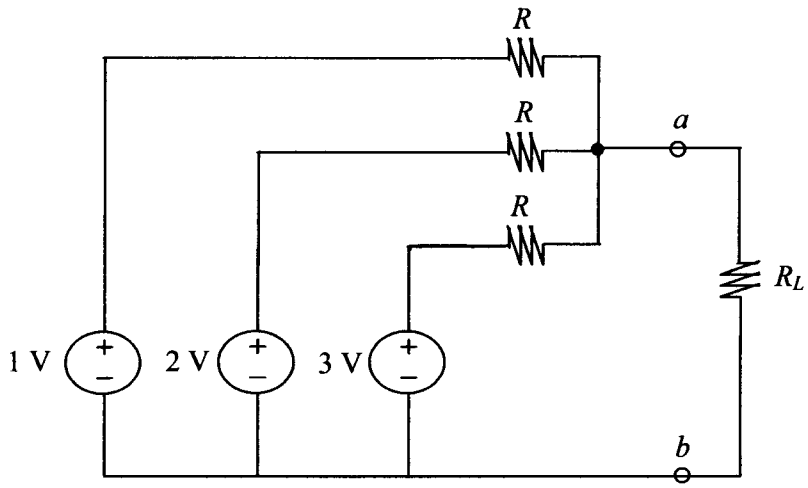

FIGURE Q3(a)

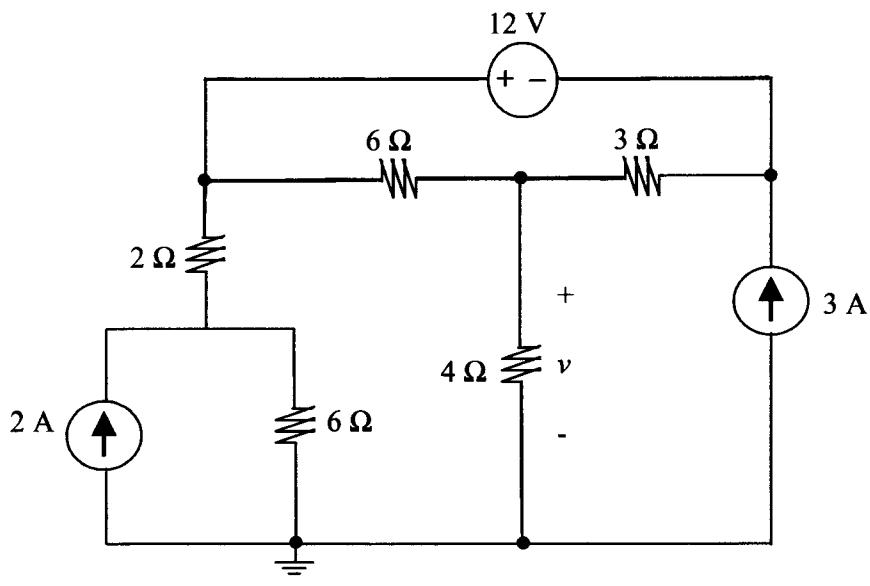

FIGURE Q3(b)

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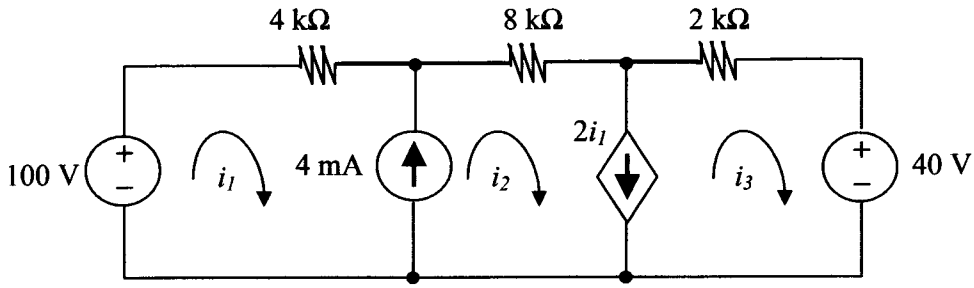

Figure Q4(a)

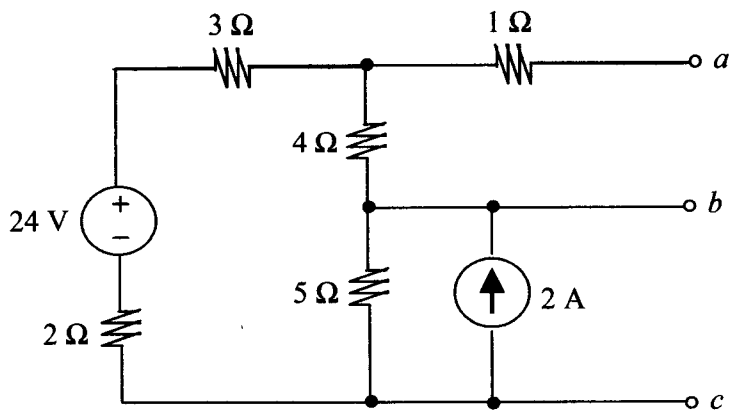

Figure Q4(b)

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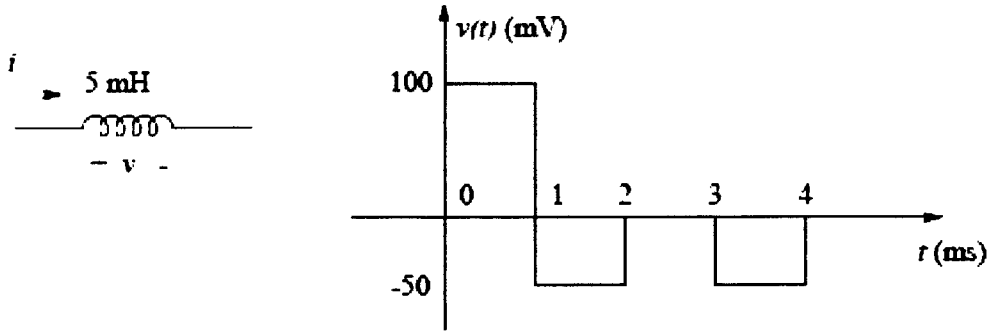

FIGURE Q5(a)

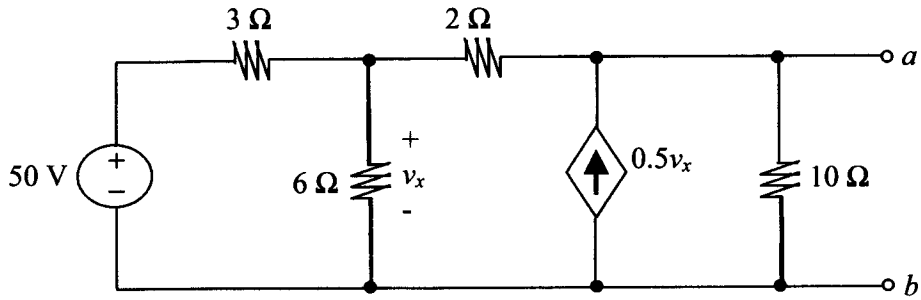

FIGURE Q5(b)

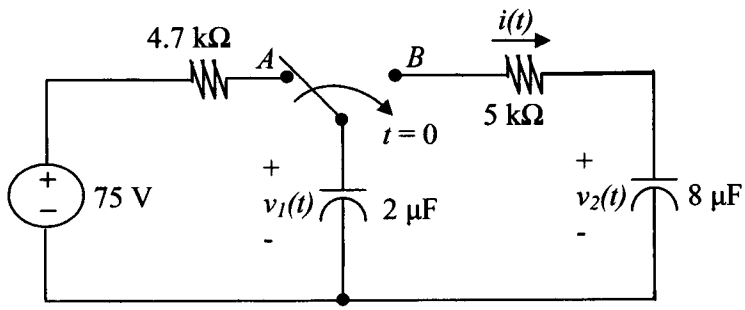

FIGURE Q6(a)

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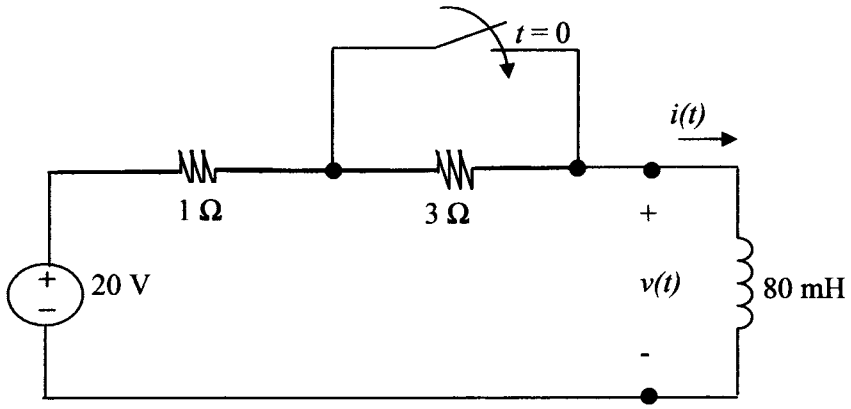

FIGURE Q6(b)

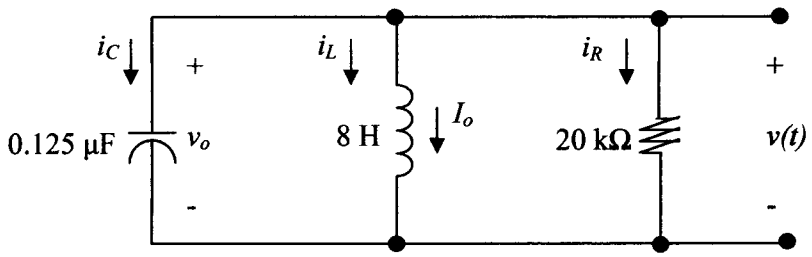

FIGURE Q7(a)

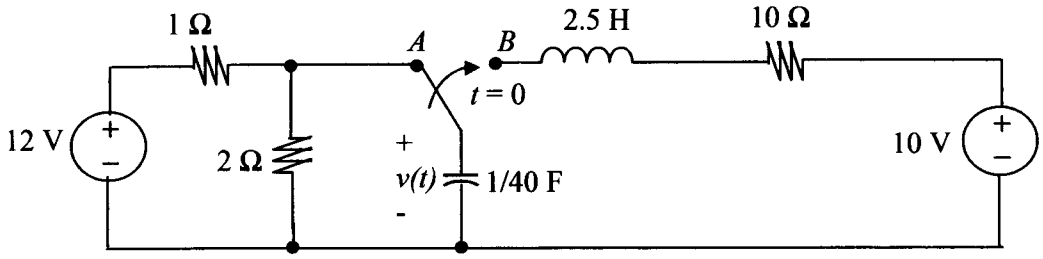

FIGURE Q7(b)