UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE	:	ELECTRICAL PRINCIPLES I
COURSE CODE	:	BNR 10203
PROGRAMME	:	BND
EXAMINATION DATE	:	DECEMBER 2012/JANUARY 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **TEN (10)** PAGES

Q1 (a) Give definition and SI unit for the following terms:

(i) Energy
(ii) Charge

(4 marks)

(b) The voltage v across a device and the current i through it are:

$$v(t) = 5\cos 2t\ V\ ,\ i(t) = 10(1-e^{-0.5t})\ A$$

(i) Calculate the total charge in the device at $t = 2\ s$
(ii) Determine the power consumed by the device at $t = 2\ s$

(6 marks)

(c) Sources can be divided into two which are independent and dependent source. Differentiate between these two sources and give examples for each type.

(4 marks)

(d) For the circuit shown in **Figure Q1 (d)**, calculate the power supplied or absorbed by each element. From your answer, prove that the total power supplied is equals to the total power absorbed.

(6 marks)

Q2 (a) State the definition of Kirchhoff Voltage Law.

(2 marks)

(b) By using Delta–Wye transformation, determine the equivalent resistance at the terminals $a - b$ for the circuit in **Figure Q2 (b)**.

(8 marks)

(c) Find I_o and V_o in the circuit of **Figure Q2 (c)**.

(10 marks)

Q3 (a) Which pair of circuits in **Figure 3 (a)** are equivalent?

(i) i and ii
(ii) ii and iv
(iii) i and iii
(iv) iii and iv

(2 marks)

(b) For the circuit in **Figure Q3 (b)**,

(i) Determine currents i_1, i_2 and i_3 using mesh analysis
(ii) Calculate the power absorbed by the 8 Ω resistor

(10 marks)

(c) Apply nodal analysis for the circuit in **Figure Q3 (c)** to find I_x and V_o.

(8 marks)

Q4 (a) Referring to the circuit in **Figure Q4 (a)**, determine V_0 using superposition theorem.

(10 marks)

(b) By using the concept of source transformation, find v_x for the circuit in **Figure Q4 (b)**.

(10 marks)

Q5 (a) With the aid of a diagram, briefly explain the maximum power transfer theorem.

(4 marks)

(b) For the circuit in **Figure Q5 (b)**,

(i) Obtain the Norton and Thevenin equivalents at terminals $a - b$
(ii) Calculate the current, i_o flowing through $R_L = 8\ \Omega$
(iii) Find the value of R_L for maximum power deliverable to R_L
(iv) Determine the maximum power delivered to R_L

(16 marks)

Q6 (a) A 50 μF capacitor connected in a telephone circuit is found to have a voltage across it as shown in **Figure Q6 (a).** The initial capacitor current is given by $i(0) = 5\ mA$.

(i) Find the current expression for $t > 0\ ms$
(ii) Obtain the power expression for $4\ ms \leq t < 8\ ms$
(iii) Draw the current waveform through the capacitor

(12 marks)

(b) Three inductors, $L_1 = 60\ mH$, $L_2 = 20\ mH$ and $L_3 = 30\ mH$, are connected in parallel across a 15 V DC source with $i(0) = 2\ A$. Determine:

(i) The total inductance
(ii) The current flowing through inductor at $t = 2\ s$
(iii) The total energy stored in the parallel combination of the inductors at $t = 2\ s$

(8 marks)

Q7 (a) For the circuit in **Figure Q7 (a)**, given that $v_c(0) = 45\ V$. At $t \geq 0$, determine

(i) The equivalent resistance
(ii) The time constant, τ
(iii) The capacitor voltage, v_c and resistor voltage, v_x
(iv) The output current, i_o

(10 marks)

(b) Assume that the switch in the circuit shown in **Figure Q7 (b)** has been at initial position for a long time, and at $t = 0$ it moves to another position. Find the value of current, $i(t)$ for the following condition;

(i) $t < 0$
(ii) $t > 0$

(10 marks)

- END OF QUESTION -

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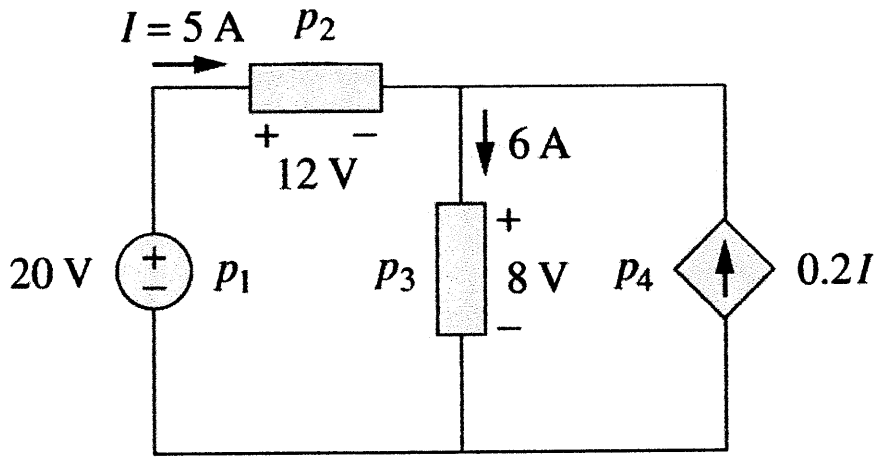

FIGURE Q1 (d)

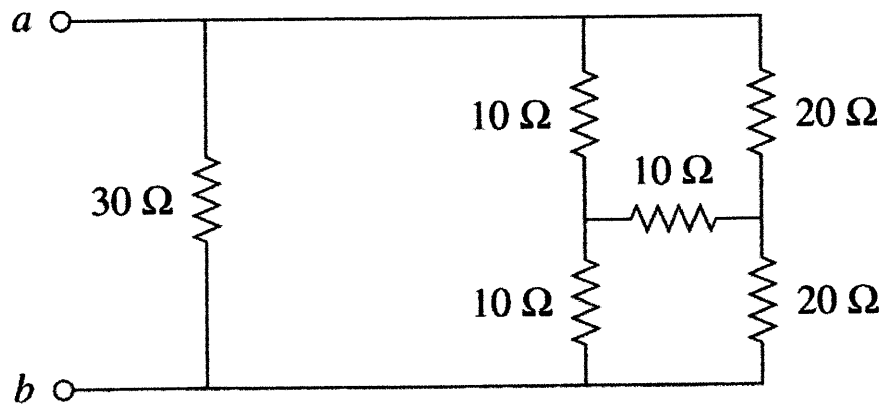

FIGURE Q2 (b)

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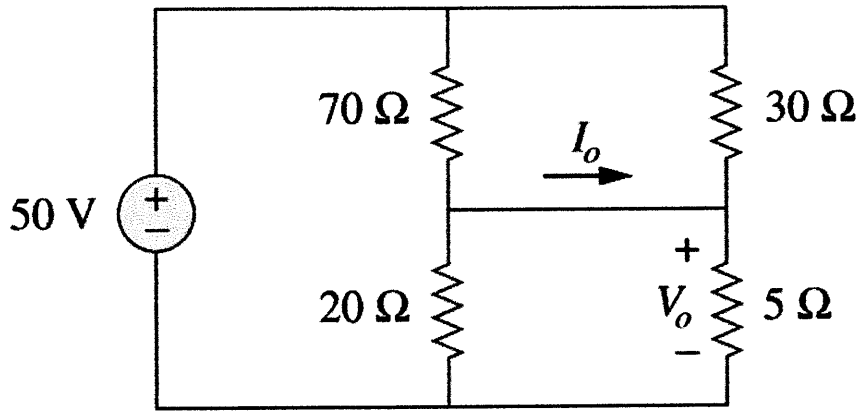

FIGURE Q2 (c)

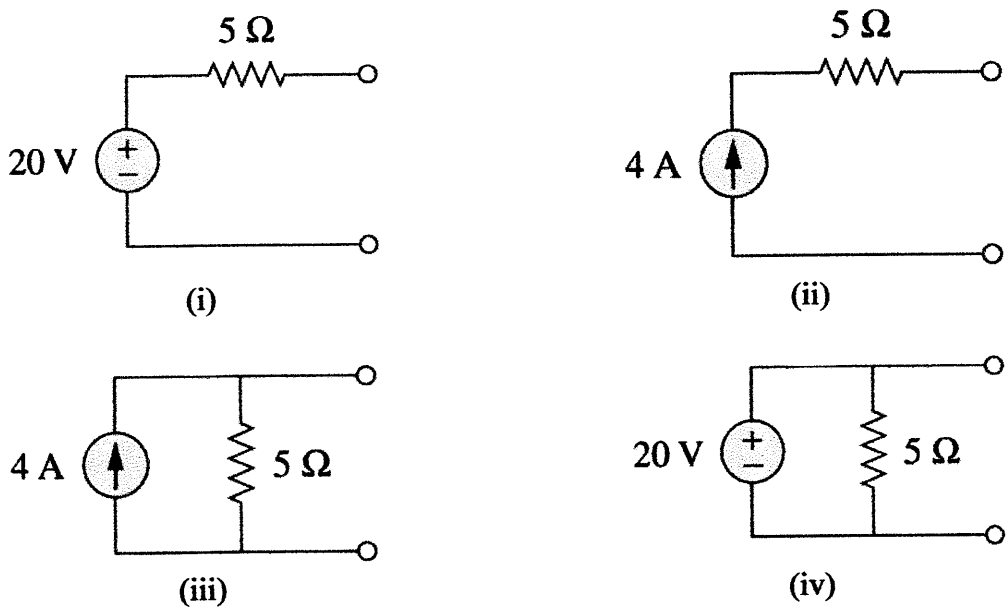

FIGURE Q3 (a)

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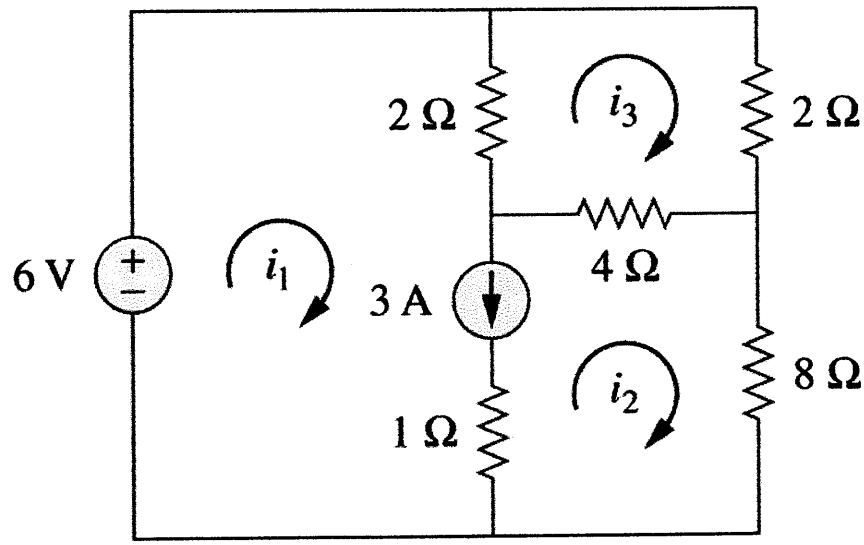

FIGURE Q3 (b)

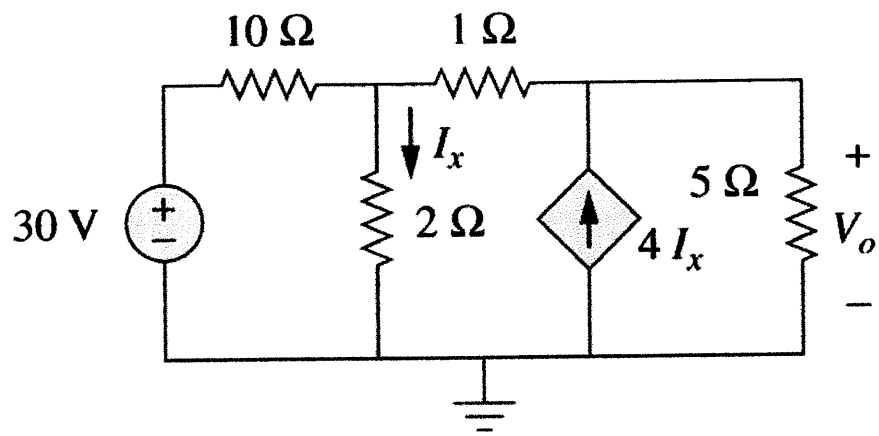

FIGURE Q3 (c)

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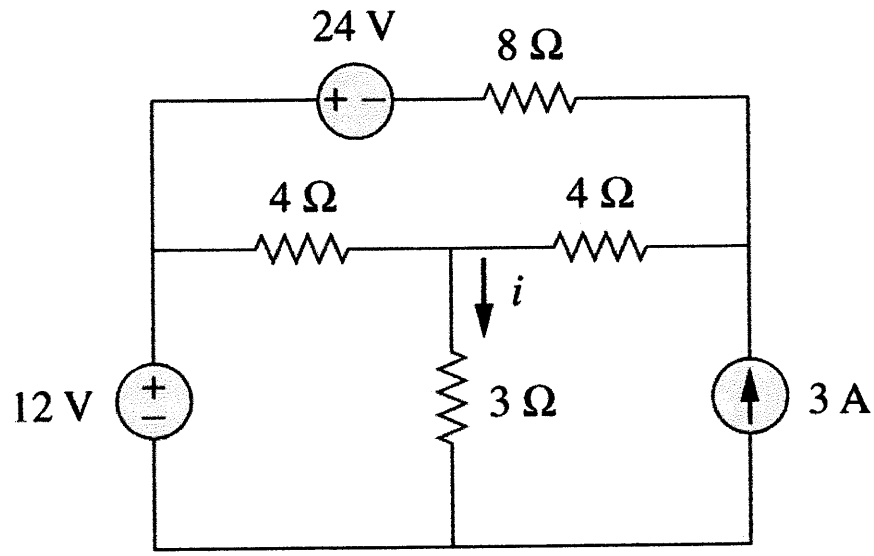

FIGURE Q4 (a)

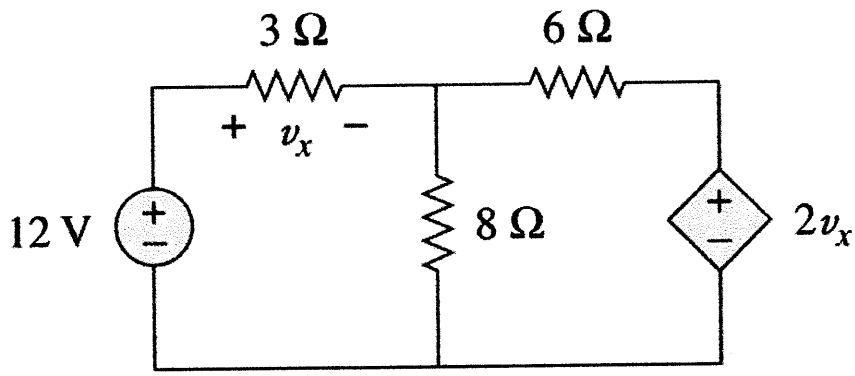

FIGURE Q4 (b)

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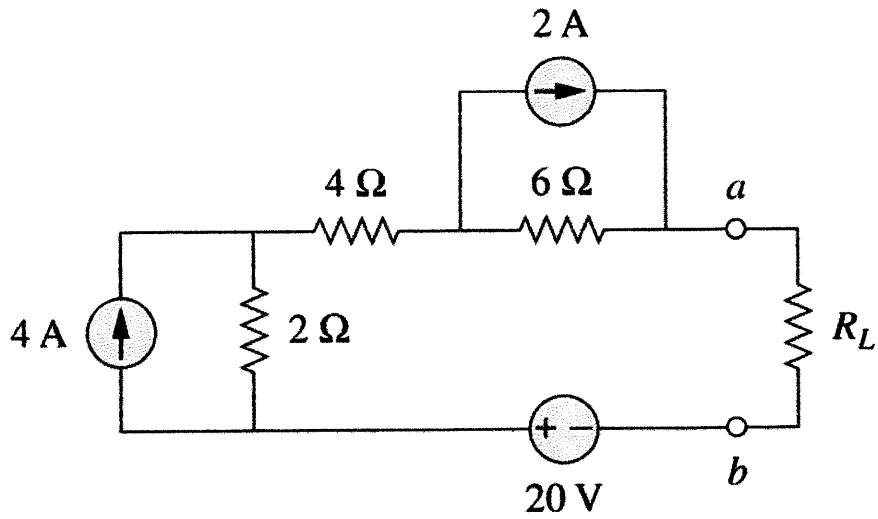

FIGURE Q5 (b)

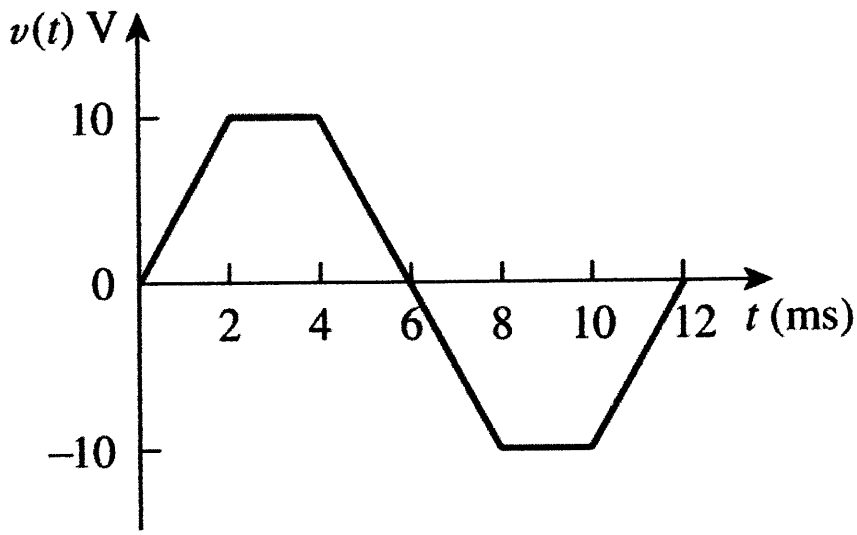

FIGURE Q6 (a)

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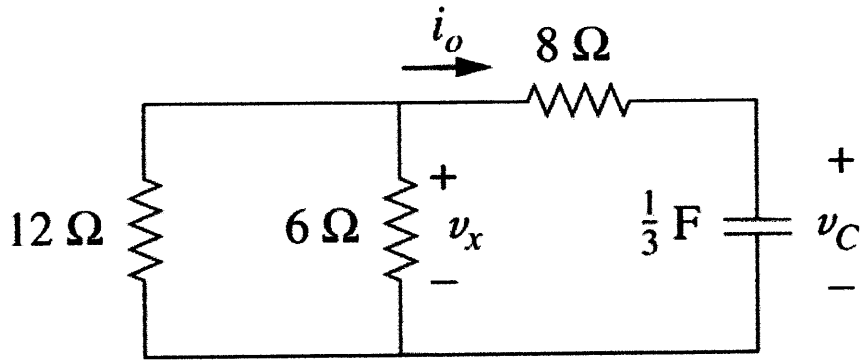

FIGURE Q7 (a)

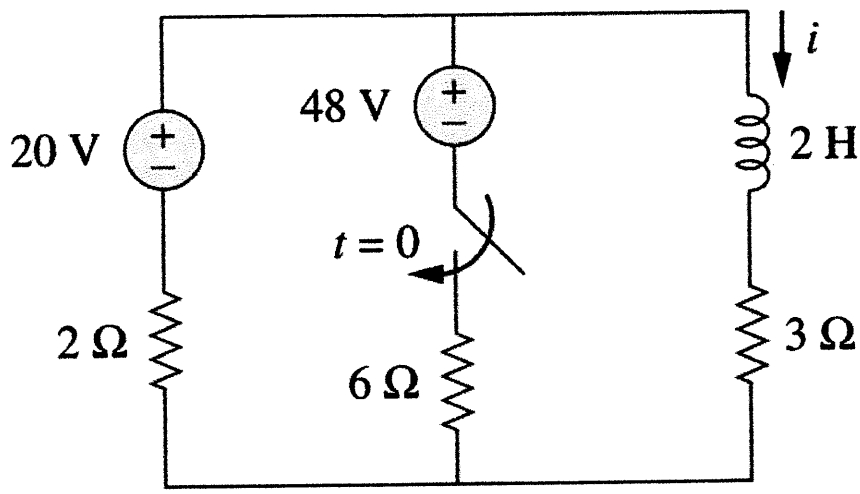

FIGURE Q7 (b)