Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017

COURSE NAME	:	ELECTRIC CIRCUITS
COURSE CODE	:	BEL 10103
PROGRAMME	:	BEJ
EXAMINATION DATE	:	DECEMBER 2016 / JANUARY 2017
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

Q1 (a) With the aid of a diagram, briefly explain the passive sign convention.

(3 marks)

(b) The numerical values of the voltages and currents in the interconnection seen in **Figure Q1(b)** are given in **Table Q1(b)**. Verify if the interconnection satisfy the power check.

(8 marks)

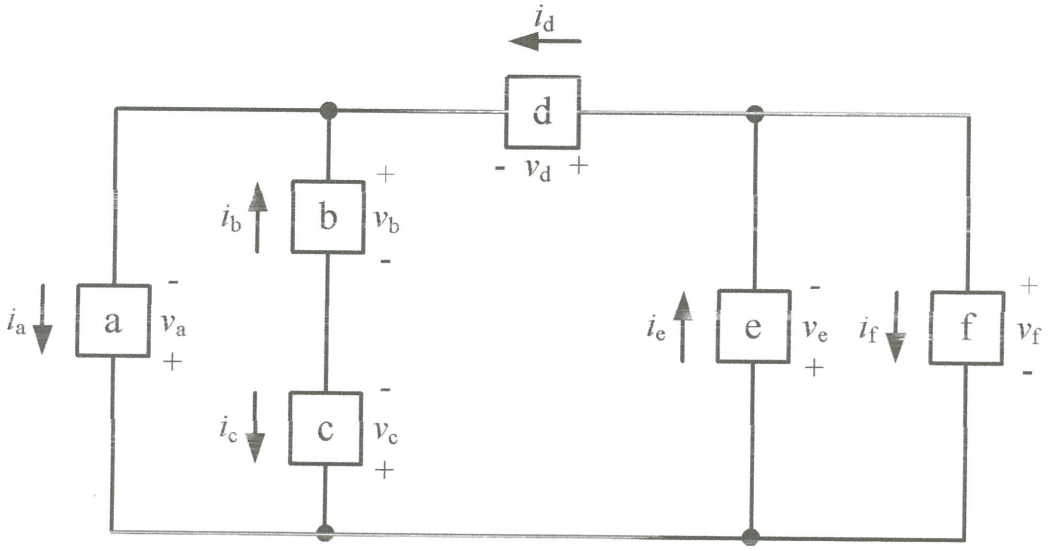

Figure Q1(b)

Table Q1(b)

Element	Voltage (kV)	Current (μA)
a	-3	-250
b	4	-400
c	1	400
d	1	150
e	-4	200
f	4	50

(c) An energy source forces a constant current of 1 A for 15 s flow through a light bulb. If 1.5 kJ is given off in the form of light and heat energy, calculate the voltage drop across the bulb.

(4 marks)

Q2 (a) Briefly explain the voltage divider concept by the aid of diagram.

(2 marks)

(b) Find equivalent R_{ab} of the circuit in **Figure Q2(b).**

(4 marks)

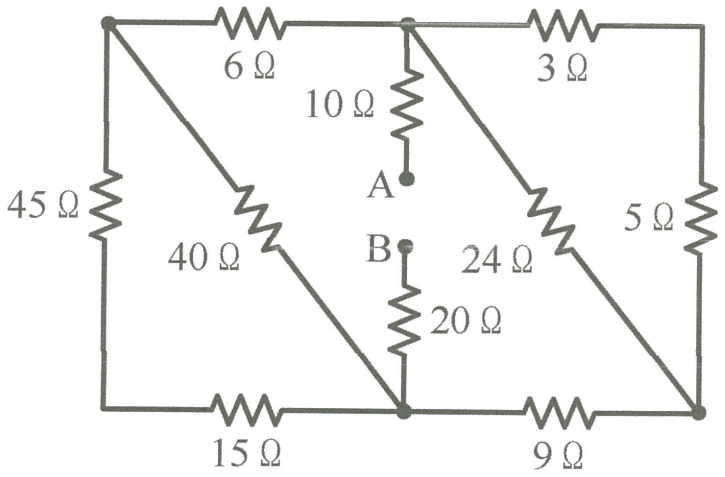

Figure Q2(b)

(c) The current flow through 20 Ω resistor in the circuit as shown in **Figure Q2(c)** is 1 A, calculate V_s.

(9 marks)

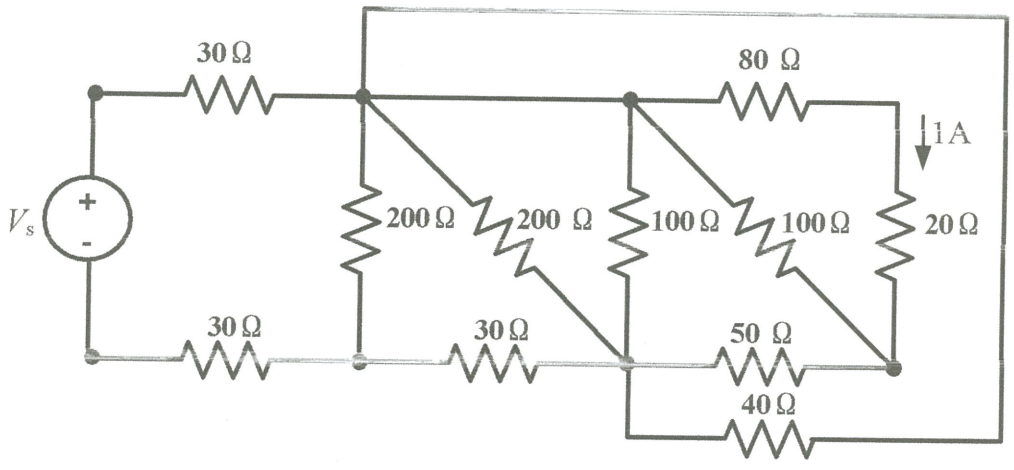

Figure Q2(c)

Q3 (a) Explain the concept of supernode in nodal analysis.

(2 marks)

(b) Find the v_o in **Figure Q3(b)**.

(4 marks)

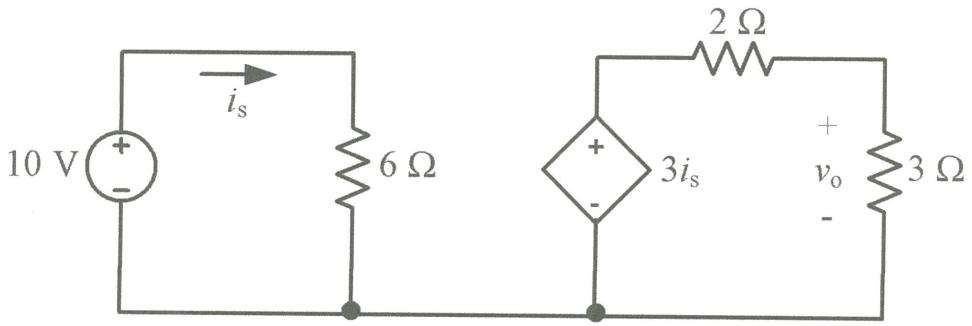

Figure Q3(b)

(c) Calculate the power dissipated in the 300 Ω resistor in the circuit shown in **Figure Q3(c)**.

(9 marks)

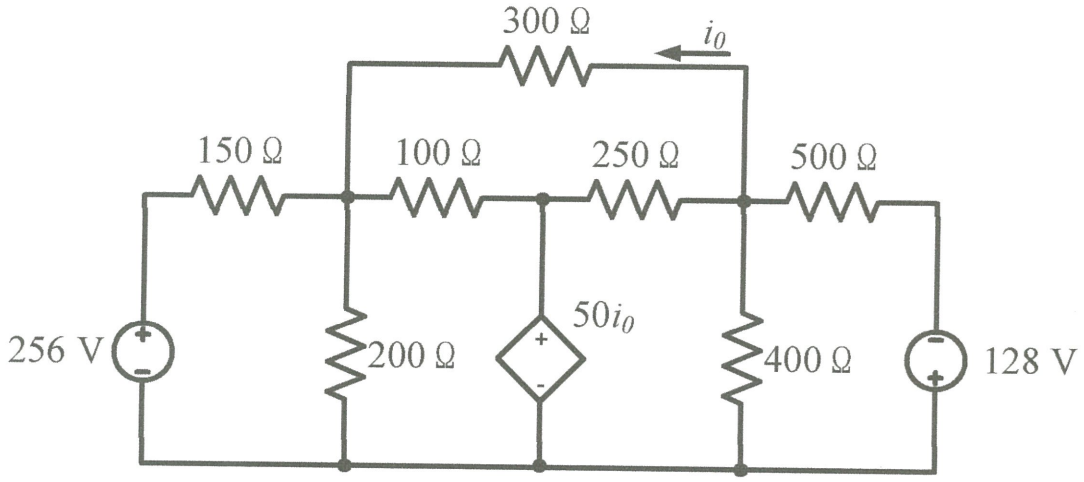

Figure Q3(c)

Q4 (a) Describe the type of response of RLC circuit in terms of α and ω_0.

(3 marks)

(b) For the circuit in **Figure Q4(b)**,

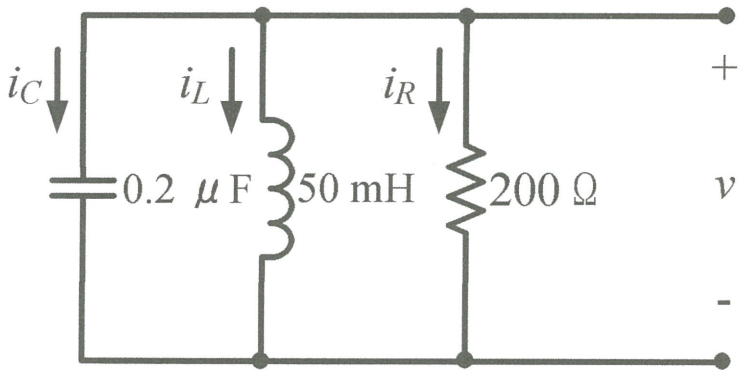

Figure Q4(b)

(i) Obtain the root of the characteristic s_1 and s_2.

(6 marks)

(ii) State the type of response.

(2 marks)

(iii) Solve the value of R causes the response to be critically damped

(4 marks)

Q5 (a) Explain the relationship between Thevenin Voltage, V_{Th} and Norton Current, I_N.

(2 marks)

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

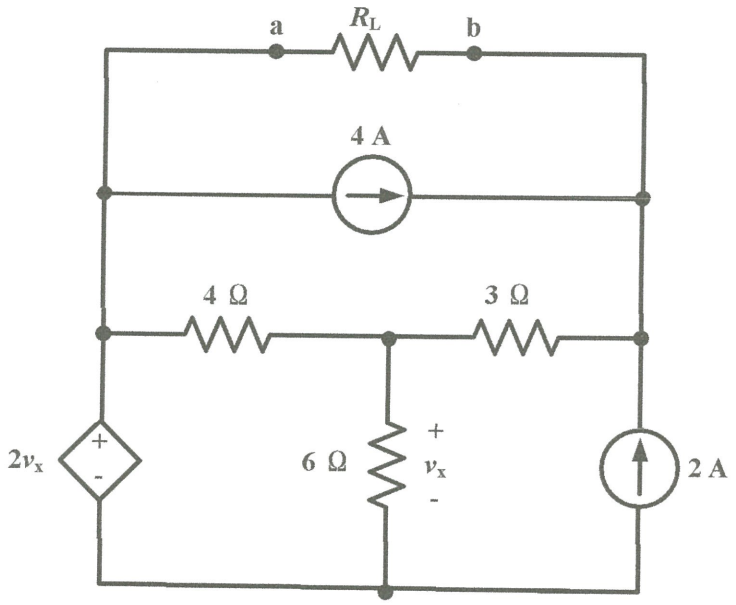

Figure Q5(b)

(i) Obtain the value of R_L for maximum power transfer to occur.

(7 marks)

(ii) Calculate the P_{max}.

(8 marks)

(c) Using a source transformation technique, calculate the current, i_0 shown in **Figure Q5(c)**.

(3 marks)

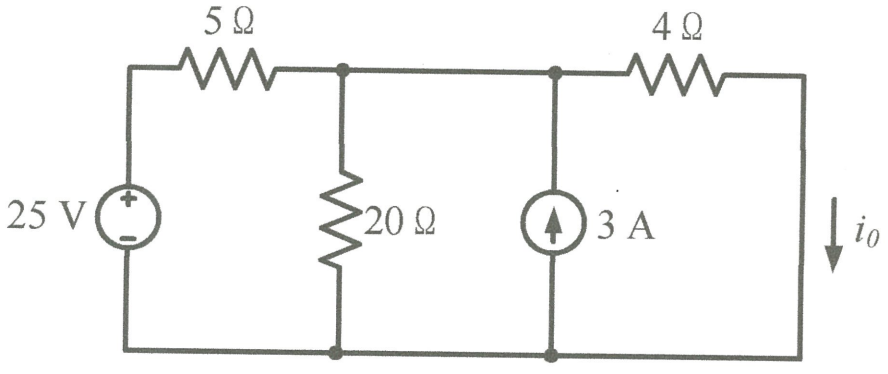

Figure Q5(c)

Q6 (a) Explain how the energy is stored in an inductor and a capacitor.

(4 marks)

(b) Consider the circuit shown in **Figure Q6(b)**, determine the voltage across 20 mH, v_1 in terms of v_0.

(6 marks)

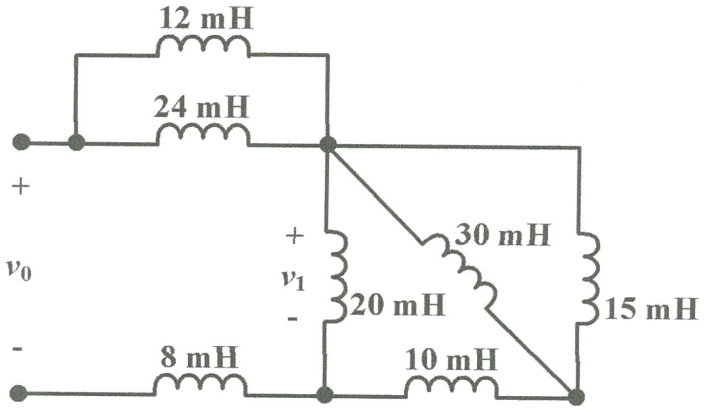

Figure Q6(b)

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

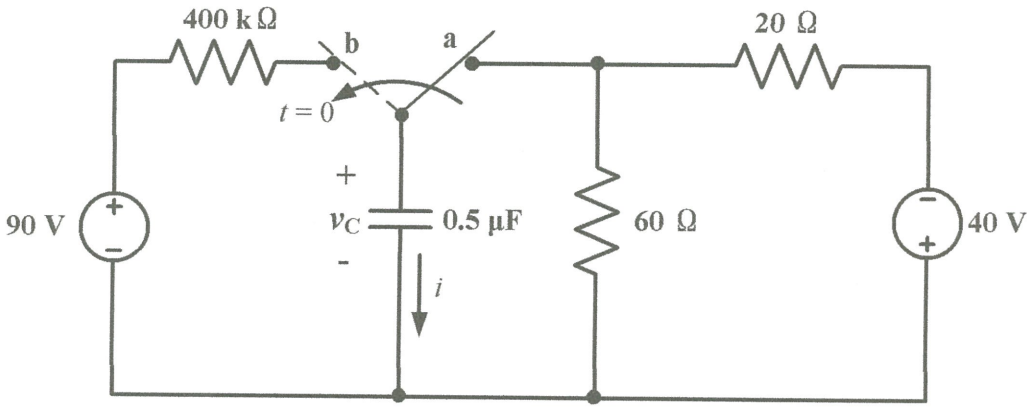

Figure Q6(c)

(i) Analyse the expression for $v_C(t)$ for $t \geq 0$.

(6 marks)

(ii) Analyse the expression for $i(t)$ for $t \geq 0$.

(4 marks)

- END OF QUESTIONS -