Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE	:	ELECTRIC CIRCUITS I
COURSE CODE	:	BEV 10303
PROGRAMME CODE	:	BEV
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) Explain the concept of power absorbed and power delivered by circuit elements if passive sign convention is considered. Please include an appropriate diagrams and equations to support your explanation.

(4 marks)

(b) (i) By using the Kirchhoff's Voltage Law (KVL), find v_x in the circuit shown in **Figure Q1(b)**.

(4 marks)

(ii) Calculate the power dissipated by the controlled source and each of the resistors in the circuit of **Figure Q1(b)**.

(8 marks)

(iii) Calculate the power supplied by the independent source in the circuit of **Figure Q1(b)**.

(2 marks)

(iv) Give the relationship between answer in **Q1(b)(ii)** and **Q1(b)(iii)**.

(2 marks)

Q2 (a) By using the nodal analysis and elimination technique, determine the voltages at the Node 1, 2 and 3 in the circuit shown in **Figure Q2(a)**.

(15 marks)

(b) Obtain the currents going through each of element.

(5 marks)

Q3 (a) Define following theorems;

(i) Thevenin's Theorem.

(2 marks)

(ii) Norton's Theorem.

(2 marks)

(b) (i) Calculate the Thevenin equivalent circuit between terminal 'a' and terminal 'b' of the circuit shown in **Figure Q3(b)**. Please use source transformation technique.

(10 marks)

(ii) Sketch and label the Norton equivalent circuit and Thevenin equivalent circuit for the circuit in **Figure Q3(b)**.

(6 marks)

Q4 (a) Determine the voltage, v_x of the circuit shown in **Figure Q4(a)** by using superposition theorem.

(10 marks)

(b) (i) The variable resistor, R_L in the circuit shown in **Figure Q4(b)** is adjusted until it absorbs the maximum power from the circuit. Calculate the value of resistor, R_L for maximum power transfer.

(3 marks)

(ii) Determine the maximum power absorbed by resistor, R_L.

(7 marks)

Q5 (a) Explain the instantaneous power and the average power.

(4 marks)

(b) Calculate the average power absorbed by an impedance $Z = 25 - j40\ \Omega$ when a voltage $V = 100\angle 0^0$ is applied across it.

(6 marks)

(c) A current flowing through a 5Ω resistor has a periodic square waveform as shown in the **Figure Q5(c)**.

(i) Determine the root mean square (rms) value of the current waveform.

(4 marks)

(ii) Determine the average value of the current waveform.

(4 marks)

(iii) Calculate the average power delivered to a 5Ω resistor.

(2 marks)

– END OF QUESTIONS –

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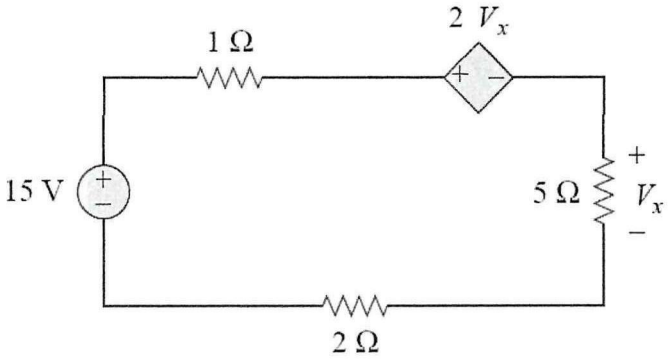

Figure Q1(b)

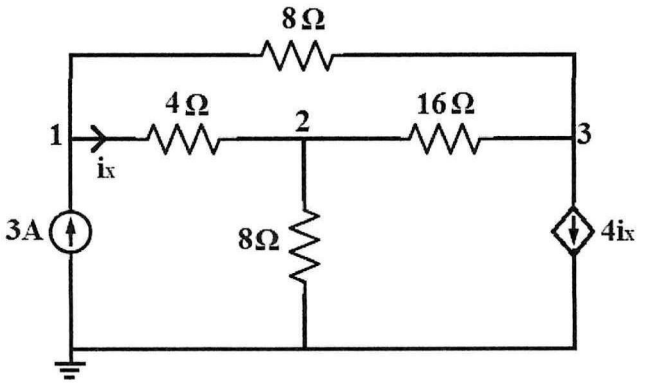

Figure Q2(a)

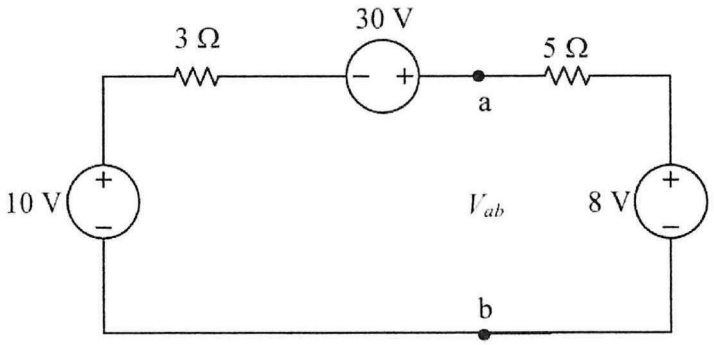

Figure Q3(b)

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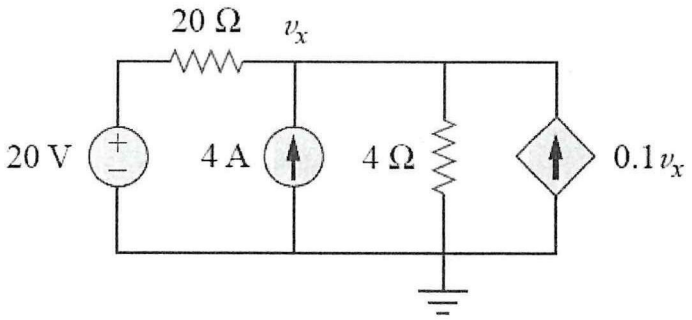

Figure Q4(a)

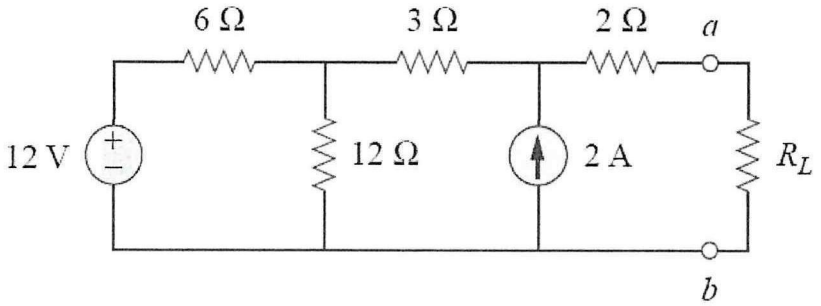

Figure Q4(b)

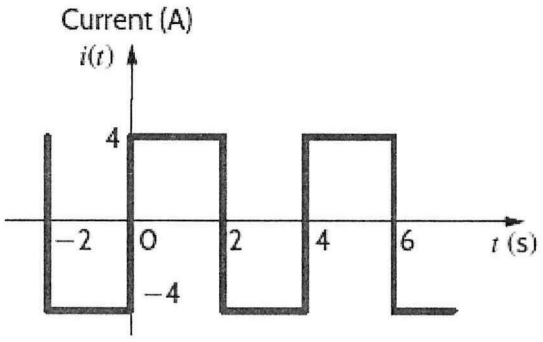

Figure Q5(c)