Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER 2
SESSION 2021/2022

COURSE NAME	:	ELECTRIC CIRCUITS 1
COURSE CODE	:	BEJ 10303
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JULY 2022
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWERS **ALL** QUESTIONS. 2. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **OPEN BOOK.**

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

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Q1 (a) An electric element, represented by box A **(Figure Q1(a))** . The direction for the current, i and the voltage across the element are shown in **Figure Q1(a)**. Calculate the power for the element and state whether the power is being absorbed or supplied for each of the following sets of numerical values:-

(i) $i = 1.5$ A, $v = 4$ V
(ii) $i = -5$ A, $v = 25$ V
(iii) $i = 10$ A, $v = -30$ V
(iv) $i = -1$ A, $v = -30$ V

(8 marks)

(b) Describe the voltage divider and current divider rule concept with the aid of a diagram.
(6 marks)

(c) Determine voltage, V_o in the circuit shown in **Figure Q1(c).**
(6 marks)

(d) A wiring circuit for a special lamp in a home is shown in **Figure Q1(d)**. The lamp has a resistance of 2Ω and the lamp will light up when $I > 50$mA but will burn out when $I > 75$mA. Determine the current in the lamp and identify if either it will light up when $R = 100\Omega$.
(5 marks)

Q2 (a) Explain the concept of supermesh and supernode in an electric circuit.
(4 marks)

(b) Nodal and mesh analysis provide a systematic way of analysing a complex network. Referring to the circuit in **Figure Q2(b)**, find the value of voltage, v_o and current, i_o by using either nodal or mesh analysis. Justify the chosen method.
(15 marks)

(c) By implementing the source transformation theorem, find the value of voltage, v_x for **Figure Q2(c)**
(6 marks)

Q3 (a) In the network shown in **Figure Q3(a),** two independent voltage sources act on the elements in the circuit. By using the superposition theorem, calculate the current, I_2.
(15 marks)

(b) In the circuit shown in **Figure Q3(b),**

(i) Find the value of open circuit voltage, V_{TH} and equivalent resistance, R_{TH} at terminal a-b.
(8 marks)

(ii) Draw the Thevenin equivalent circuit at terminal a-b.
(2 marks)

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Q4 (a) The circuit shown in **Figure Q4(a)** is used to represent one part of the overall automatic watering system for a plantation in Batu Pahat with the input voltage, $v_s(t)$.

(i) Compute the instantaneous current flows through 1kΩ resistor over a period and sketch the waveform.

(10 marks)

(ii) Calculate the average and the effective current flows through 1kΩ resistor.

(4 marks)

(b) Given a voltage and current waveforms $v(t)$ =160 *cos* 50t V and $i(t)$ = –20 *sin* (50t – 30°) A, being applied to a passive linear network. Find the instantaneous power and average power absorbed by the passive linear network.

(5 marks)

(c) By using an example of a sine wave, describes the difference between the instantaneous value, the average value, and the effective value of this voltage signal.

(6 marks)

-END OF QUESTIONS –

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FINAL EXAMINATION

SEMESTER / SESSION : SEM 2 2021/2022
COURSE NAME : ELECTRIC CIRCUITS 1
PROGRAMME CODE : BEJ
COURSE CODE : BEJ 10303

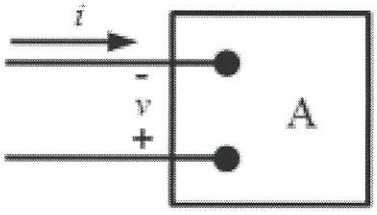

Figure Q1(a)

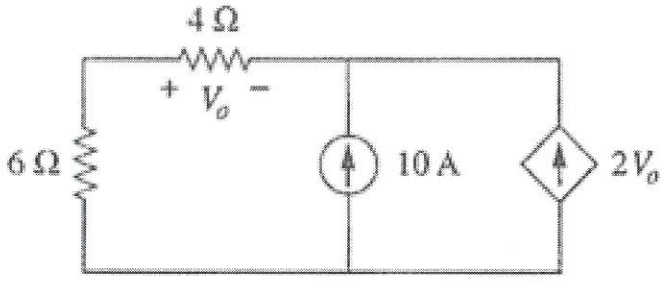

Figure Q1(c)

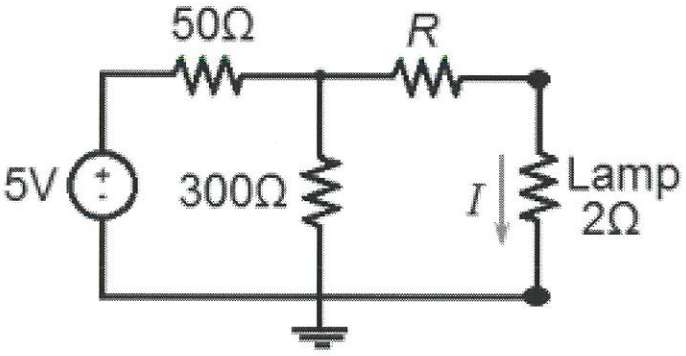

Figure Q1(d)

FINAL EXAMINATION

SEMESTER / SESSION : SEM 2 2021/2022
COURSE NAME : ELECTRIC CIRCUITS 1
PROGRAMME CODE : BEJ
COURSE CODE : BEJ 10303

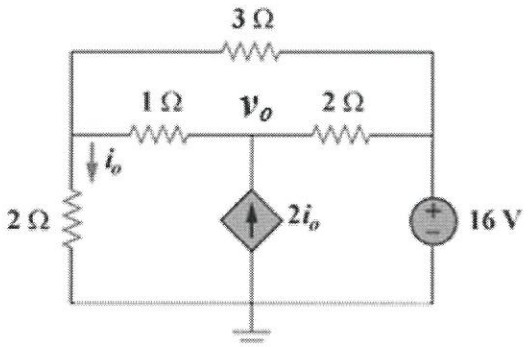

Figure Q2(b)

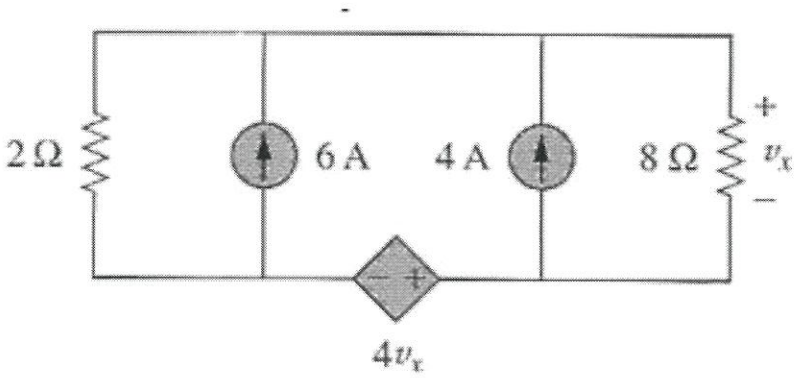

Figure Q2(c)

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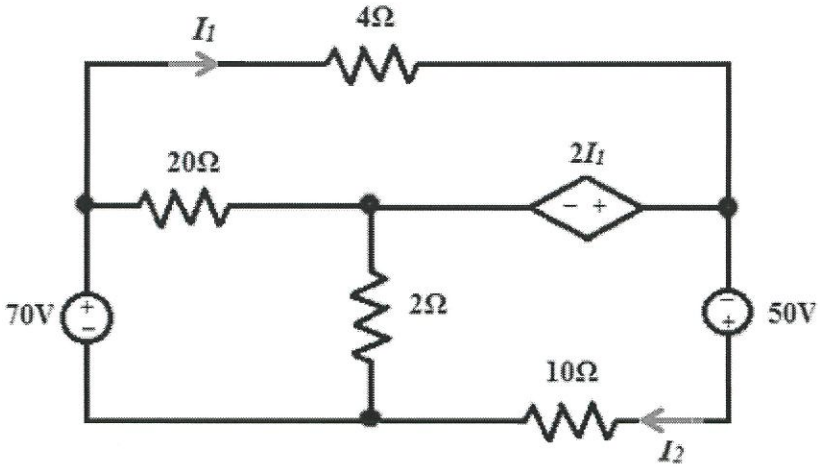

Figure Q3(a)

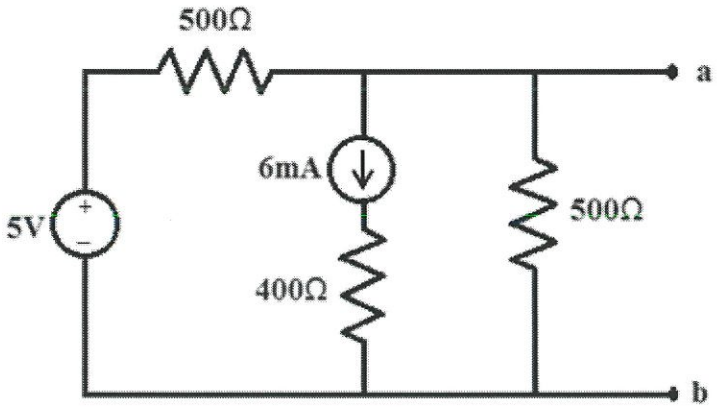

Figure Q3(b)

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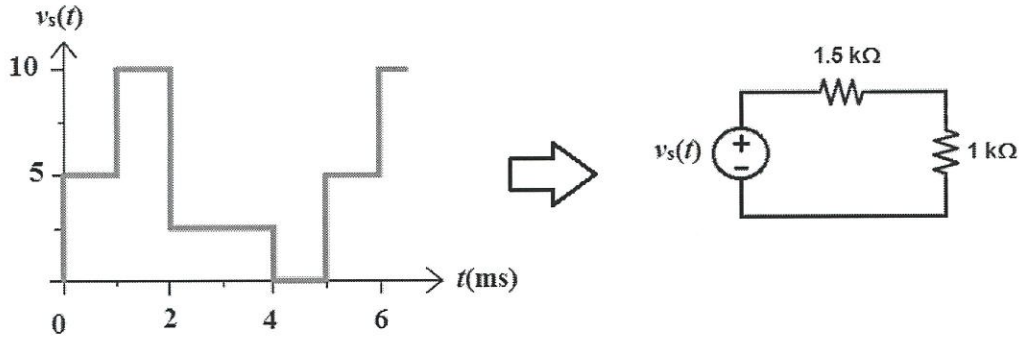

Figure Q4(a)