Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(TAKE HOME)
SEMESTER II
SESSION 2020/2021

COURSE NAME	:	ELECTRIC CIRCUITS 1
COURSE CODE	:	BEJ 10303
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JULY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) A series-parallel circuit network is given in **Figure Q1(a)**.

(i) Determine the equivalent resistance at terminal A-B.

(8 marks)

(ii) If a voltage source, V_{AB} is connected at terminal A-B, with a value of 10V, calculate the current, I_x.

(4 marks)

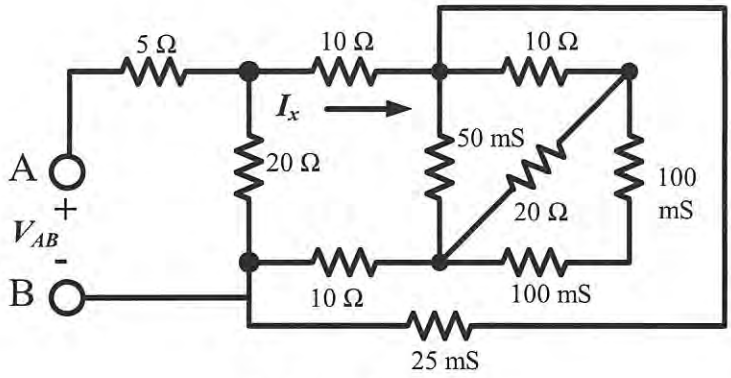

Figure Q1(a)

(b) An electrical engineer receives a wiring network diagram of a pet house as shown in **Figure Q1(b)**. He asks for your help to do the following tasks:

(i) Redraw the network circuit with the unknowns (node - A, V_1, V_2, V_3, and I_x) so that the relationship between branches become significantly clearer.

(5 marks)

(ii) Using suitable approach, find V_1, V_2, V_3, and I_x if V_{S1} = -12 V and V_{S2} = 5 V.

(6 marks)

(iii) Calculate power at 30Ω resistor.

(2 marks)

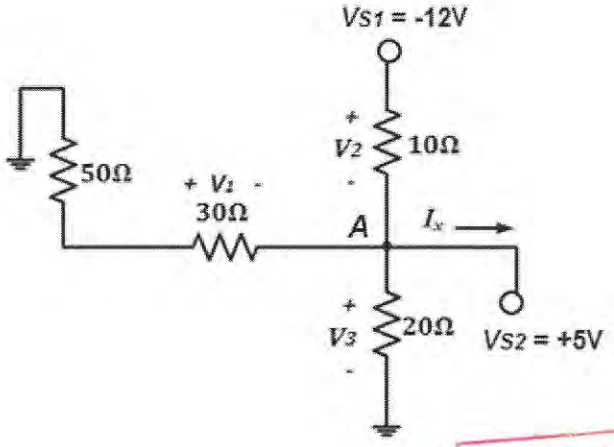

Figure Q1(b)

Q2 (a) Calculate the current through each passive element of the circuit network in **Figure Q2(a)** using:

(i) Nodal analysis. Identify in your answer how to find the v_a, v_b, v_1 and v_2. (12 marks)

(ii) Supermesh analysis. (Remark: No need to find the v_a, v_b, v_1 *and* v_2). (6 marks)

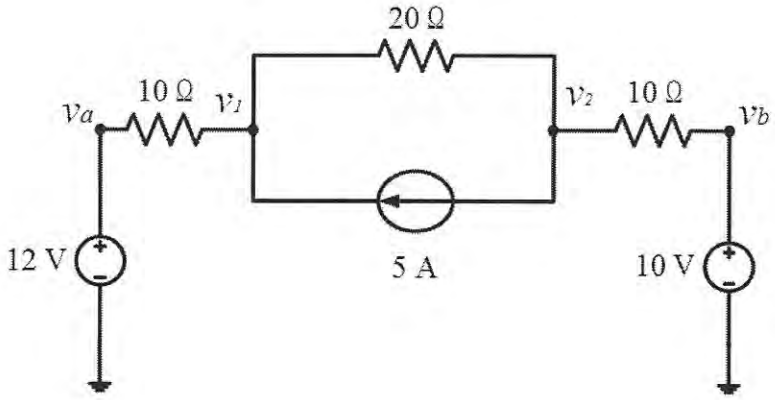

Figure Q2(a)

(b) Determine the voltage potential across 5Ω resistor in **Figure Q2(b)**. (7 marks)

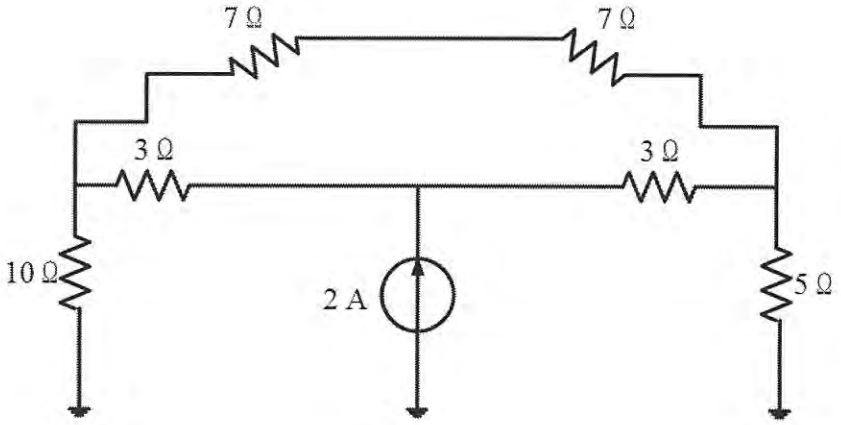

Figure Q2(b)

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

(15 marks)

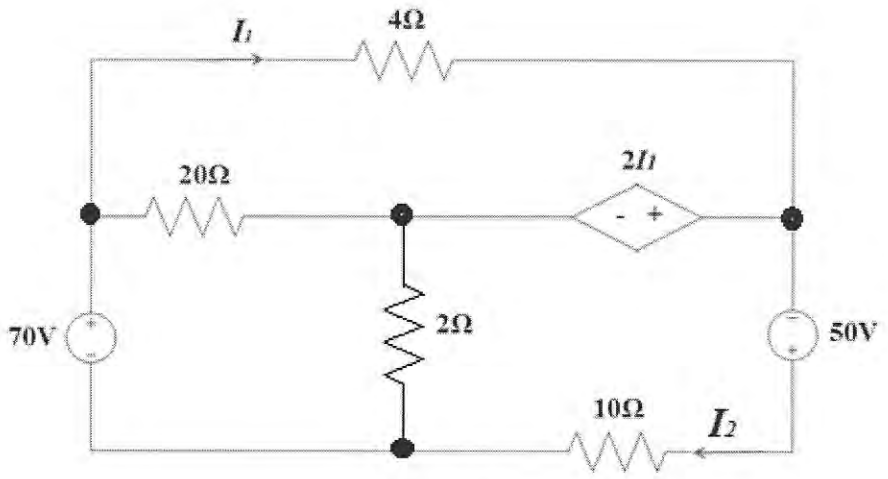

Figure Q3(a)

(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)

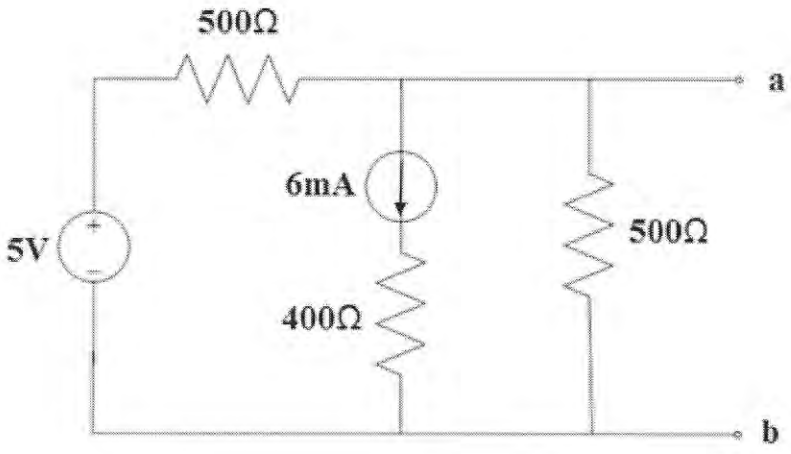

Figure Q3(b)

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)

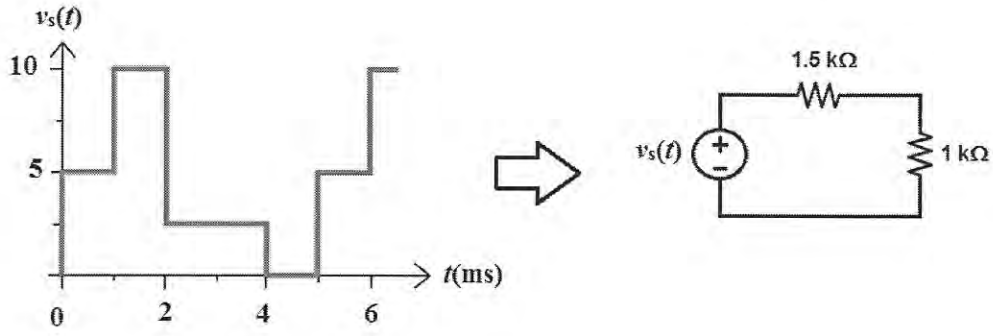

Figure Q4(a)

(b) Given a voltage and current waveforms (t) =160 *cos* 50t V and (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, describe the difference among the instantaneous value, the average value, and the effective value of this voltage signal.

(6 marks)

– END OF QUESTIONS –