Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	ELECTRIC CIRCUIT II
COURSE CODE	:	BEV 10403
PROGRAMME CODE	:	BEV
EXAMINATION DATE	:	JULY / AUGUST 2023
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS. 2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK.** 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

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

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Q1 (a) (i) Describe the working principles of an inductor.

(1 mark)

(ii) Derive an expression of current, i in terms of voltage, v for a linear inductor.

(3 marks)

(b) Assume that the inductor is initially energized. The voltage waveform of v(t) is shown in **Figure Q1(b)**. In the passive sign convention and as a function of time, determine and plot the waveform for;

(i) The current through the inductor, $i(t)$.

(10 marks)

(ii) The power absorbed by the inductor, $p(t)$.

(3 marks)

(iii) The energy stored in the inductor, $e(t)$.

(3 marks)

Q2 (a) A capacitor is in series with a 10 Ω resistor and 0.8 H inductor. Find the value of capacitor, C, that makes the RLC series circuit is to be overdamped.

(4 marks)

(b) The switch in the circuit of **Figure Q2 (b)** is opened at t = 0s. Determine i(t) for t > 0s.

(i) Determine $i_o(0^-)$ for t < 0s.

(3 marks)

(ii) Determine $i_o(t)$ for t > 0s.

(13 marks)

Q3 (a) **Figure Q3(a)** shows an example of parallel circuit.

(i) Calculate and draw the equivalent circuit in frequency domain.

(3 marks)

(ii) Calculate the value of voltage, V and current, I_1 and I_2.

(6 marks)

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(b) Refer to **Figure Q3(b).**

(i) Calculate the total impedance, Z_{eq} seen from the input terminal.

(5 marks)

(ii) Analyze the output voltage, V_o when the input is $120\angle 30°$ V.

(5 marks)

(iii) Identify whether the phase shift is leading or lagging.

(1 mark)

Q4 (a) Refer to **Figure Q4(a)**, the loads are $\mathbf{Z_1} = 60\angle -30° \ \Omega$ and $\mathbf{Z_2} = 40\angle 45° \ \Omega$.

(i) Calculate the total complex power absorbed by the impedances.

(2 marks)

(ii) Calculate the total apparent power.

(2 marks)

(iii) Find the total real power.

(1 mark)

(iv) Calculate the total reactive power.

(1 mark)

(v) Evaluate the power factor (PF).

(2 marks)

(b) **Figure Q4(b)** shows a system containing LOAD 1, LOAD 2 with their power factor (PF) value. Based on this circuit,

(i) Determine the total power absorbed by the impedances.

(6 marks)

(ii) Find the current flowing into each load.

(4 marks)

(iii) Calculate the total current flowing in the circuit.

(2 marks)

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Q5 (a) Differentiate between one port network and two port network by defining and drawing those two networks respectively.

(4 marks)

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

(i) Calculate the current, I_1 and I_2.

(4 marks)

(ii) Calculate the voltage, V_1 and V_2.

(4 marks)

(c) Refer to **Figure Q5(c),** calculate the admittance parameter of the circuit.

(8 marks)

-END OF QUESTIONS –

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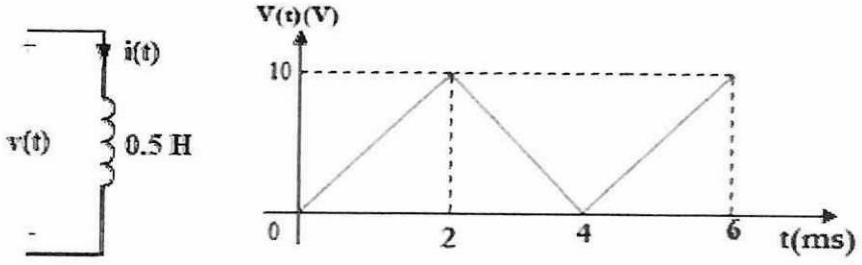

Figure Q1(b)

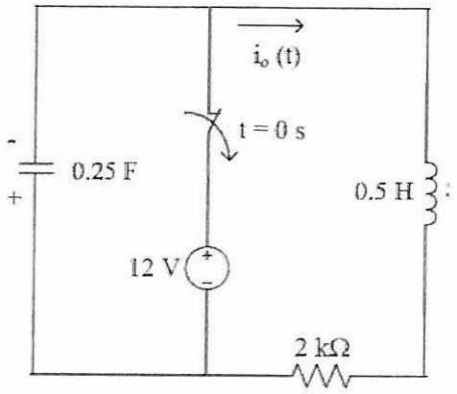

Figure Q2(b)

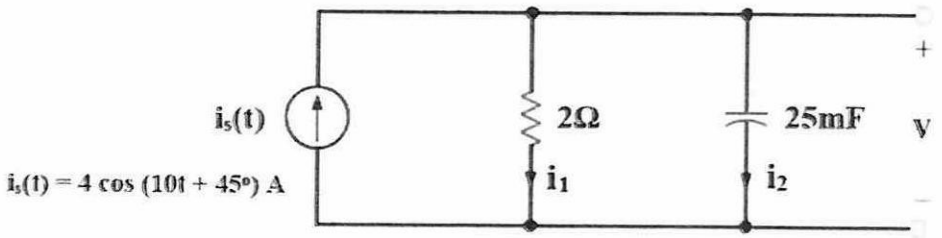

Figure Q3(a)

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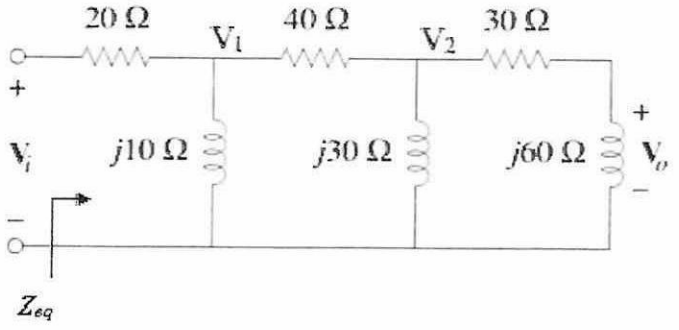

Figure Q3(b)

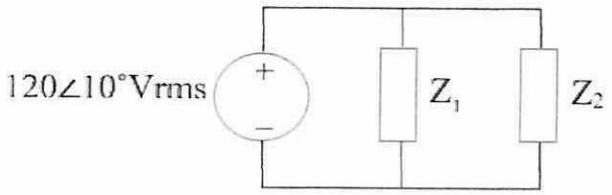

Figure Q4(a)

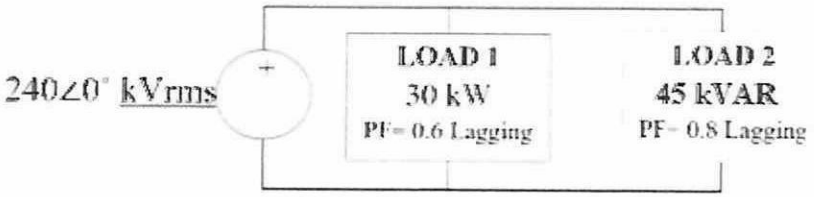

Figure Q4(b)

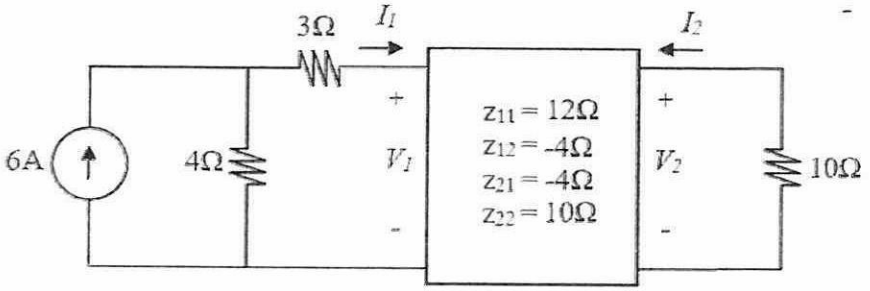

Figure Q5(b)

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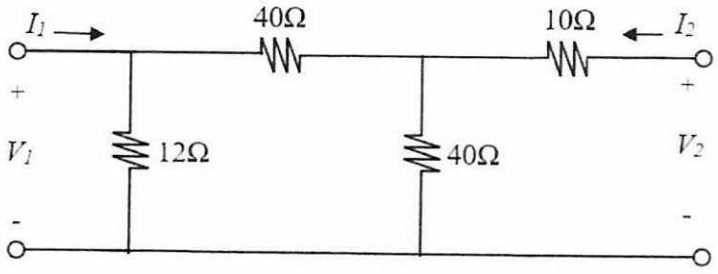

Figure Q5(c)

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