



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023**

COURSE NAME	:	ELECTRICAL PRINCIPLES II
COURSE CODE	:	BNR 10303
PROGRAMME CODE	:	BND/BNE/BNF
EXAMINATION DATE	:	JULY/ AUGUST 2023
DURATION	:	3 HOURS
INSTRUCTIONS	:	<ol style="list-style-type: none">1. ANSWER ALL QUESTIONS2. THIS FINAL EXAMINATION IS CONDUCTED VIA CLOSED BOOK3. 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

Q1 (a) In a linear circuit, the voltage source is

$$v_s = 12 \sin(10^3 t + 24^\circ) \text{ V}$$

- (i) Determine the angular frequency of the voltage. (2 marks)
- (ii) Calculate the frequency of the source. (2 marks)
- (iii) Calculate the period of the voltage. (2 marks)
- (iv) Express v_s in cosine form. (2 marks)
- (v) Determine v_s at $t = 2.5$ ms. (2 marks)

(b) Using phasors, determine $i(t)$ in the following equations:

(i) $2 \frac{di}{dt} + 3i(t) = 4 \cos(2t - 45^\circ)$ (5 marks)

(ii) $10 \int i dt + \frac{di}{dt} + 6i(t) = 5 \cos(5t + 22^\circ)$ (5 marks)

(c) Evaluate i_x when $i_s = 2 \sin 5t$ A, is supplied to the circuit in **Figure Q1(c)**. (5 marks)

Q2 (a) By using mesh analysis, evaluate current I_o in the circuit in **Figure Q2(a)**. (20 marks)

(b) Use nodal analysis to evaluate v_o in the circuit in **Figure Q2(b)**. (5 marks)

- Q3** (a) At $t = 2$ s, evaluate the instantaneous power on each of the elements in the circuit shown in **Figure Q3(a)**.
(17 marks)
- (b) For the circuit in **Figure Q3(b)**, evaluate:
- (i) the value of the load impedance that absorbs the maximum average power.
(2 marks)
- (ii) the value of the maximum average power absorbed.
(6 marks)
- Q4** (a) Differentiate between balanced phase voltages and balanced load.
(4 marks)
- (b) Three 230 V generators form a delta-connected source that is connected to a balanced delta-connected load of $Z_L = 10 + j8 \ \Omega$ per phase as shown in **Figure Q4(b)**.
- (i) Determine the value of I_{AC}
(2 marks)
- (ii) Determine the value of I_{bB}
(2 marks)
- (c) Calculate the total inductance for the three coupled coils in **Figure Q4(c)**.
(3 marks)
- (d) Given the circuit in **Figure Q4(d)**, with $V_1 = 10$ V, $V_2 = 10$ V, $R_1 = R_2 = 10$ Ohm, $\omega L_1 = \omega L_2 = 10$, and $\omega M = 5$. Determine:
- (i) The coupling coefficient, k
(2 marks)
- (ii) The currents in the primary and secondary circuits, I_1 and I_2
(12 marks)

- END OF QUESTIONS -

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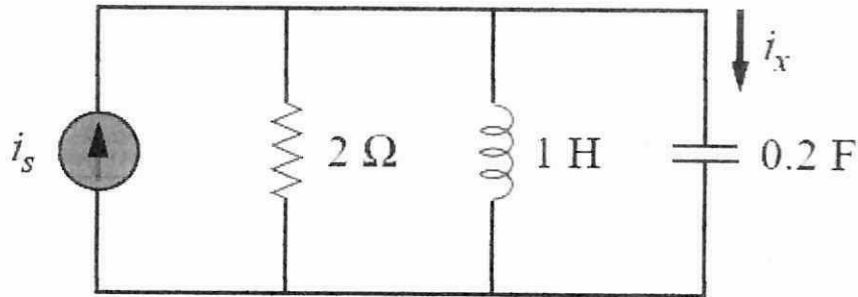


Figure Q1(c)

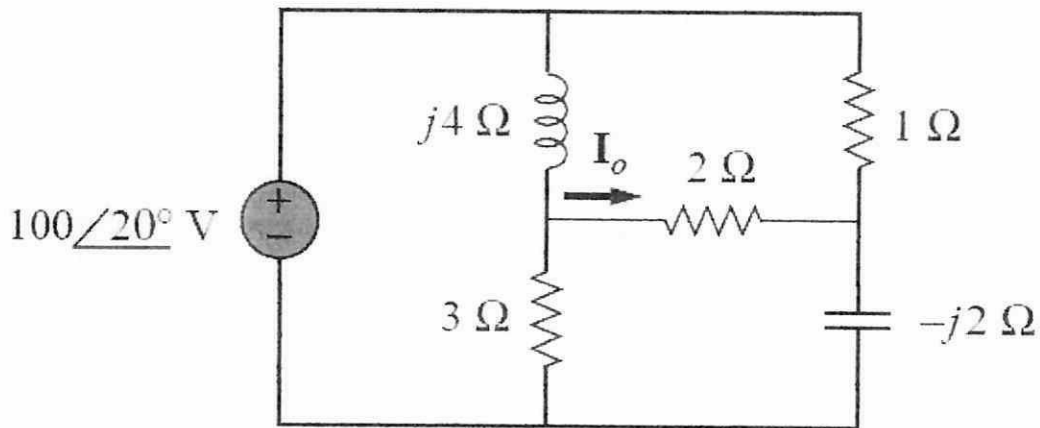


Figure Q2(a)

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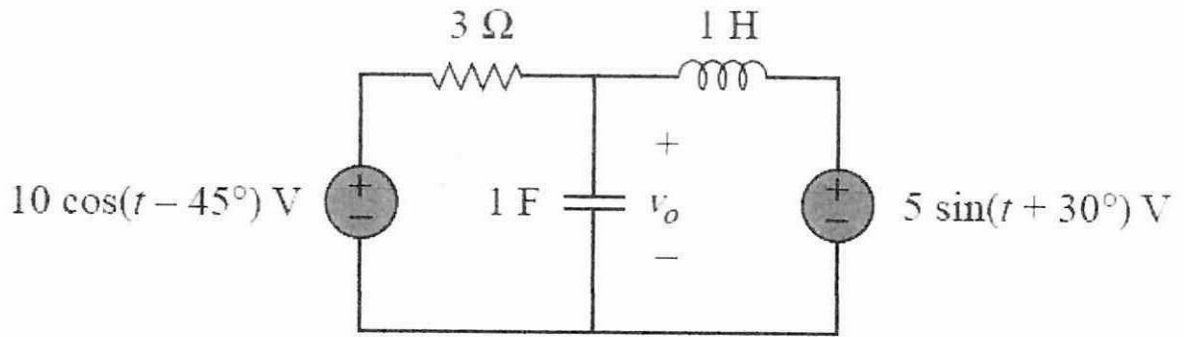


Figure Q2(b)

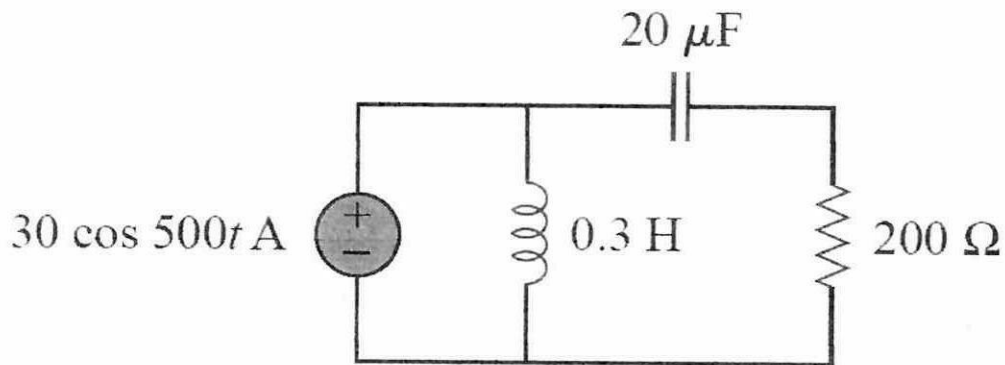


Figure Q3(a)

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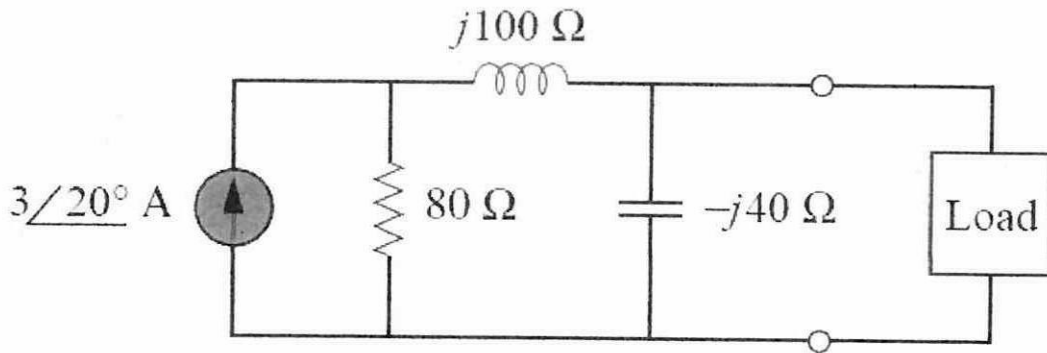


Figure Q3(b)

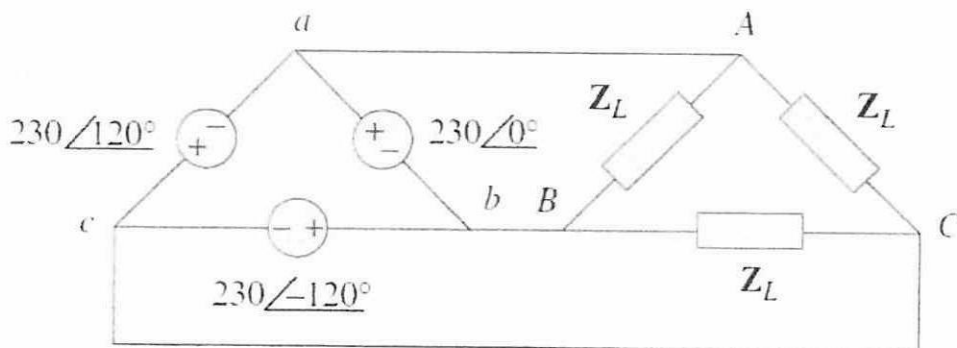


Figure Q4(b)

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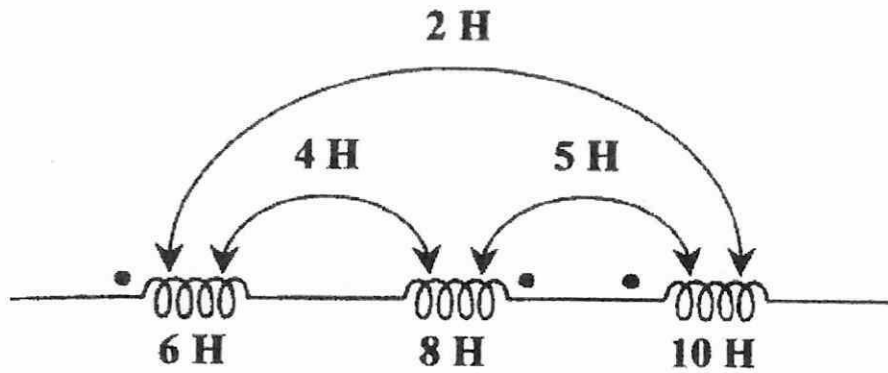


Figure Q4(c)

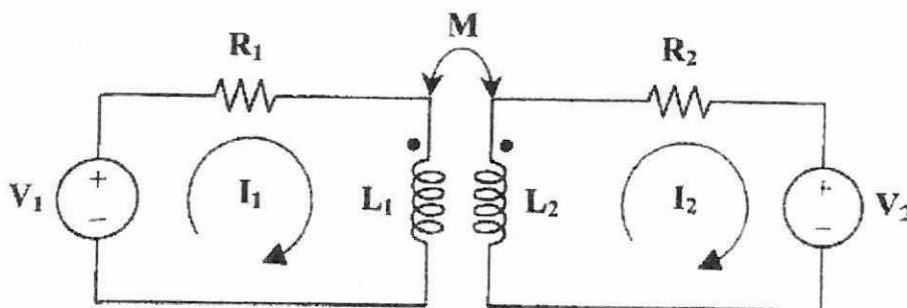


Figure Q4(d)

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