



UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION
OCTOBER 2025 SEMESTER SESSION

SUBJECT CODE	: LEB20403
SUBJECT TITLE	: ELECTRIC CIRCUIT
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	: BACHELOR OF ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY (MARINE) WITH HONOURS
TIME / DURATION	: 2.00 PM – 5.00 PM (3 HOURS)
DATE	: 26 JANUARY 2026

INSTRUCTIONS TO CANDIDATES

1. Please read **CAREFULLY** the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. Please answer **FOUR (4)** questions **ONLY**.
4. Please write your answers on the answer booklet provided.
5. Answer should be written in blue or black ink except for sketching, graphic and illustration.
6. Answer all questions in English language **ONLY**.

THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer FOUR (4) questions ONLY.

Please use the answer booklet provided.

Question 1

(a) A 550-V feeder line supplies an industrial plant consisting of a motor drawing 60 kW at 0.75 pf (inductive), a capacitor with a rating of 20 kVAR, and lighting drawing 20 kW as shown in Figure 1.

- i. Calculate the total reactive power and apparent power absorbed by the plant (10 marks)
- ii. Determine the overall power factor (3 marks)
- iii. Determine the current in the feeder line (2 marks)

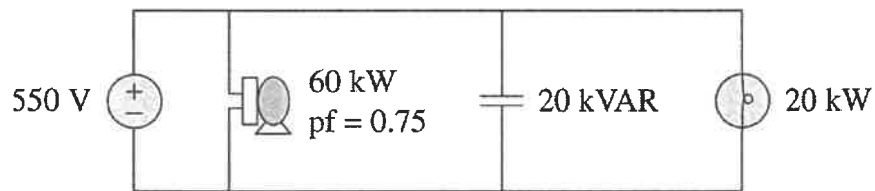


Figure 1

(b) Solve the value of V_3 and mesh currents using the Mesh analysis method for the circuit in Figure 2.

(10 marks)

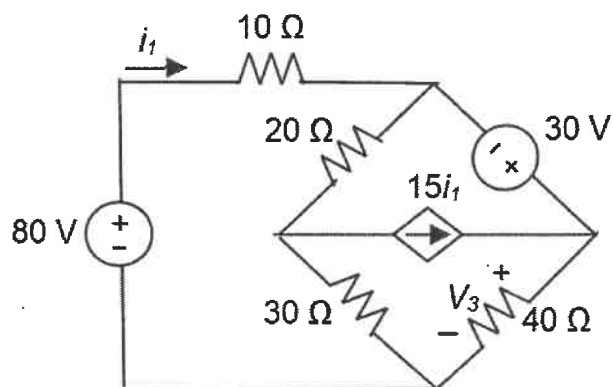


Figure 2

Question 2

- (a) Determine the following parameters for a series RLC circuit with bandwidth, $B = 20$ rad/s and resonate at frequency, $\omega_0 = 1000$ rad/s. Let $R = 10 \Omega$ and $V_m = 20$ V.
- i. The circuit's Q, (2 marks)
 - ii. The cut-off frequencies, (4 marks)
 - iii. The amplitude of the current at ω_0, ω_1 and ω_2 (4 marks)
 - iv. Illustrate the circuit with necessary value. (5 mark)
- (b) A three-phase 440-V, 51 kW, 60 kVA inductive load operates at 60 Hz and is wye-connected. It is desired to correct the power factor to 0.95 lagging. Identify the value of capacitor should be placed in parallel with each load impedance. (10 marks)

Question 3

- (a) A three-phase, four-wire system operating with a 208-V line voltage is shown in Figure 3. The source voltages are balanced. The power absorbed by the resistive wye-connected load is measured by the three-wattmeter method. Calculate:
- The voltage to neutral (1 mark)
 - The currents I_1 , I_2 and I_3 (6 marks)
 - The readings of the watt meters (6 marks)
 - The total power absorbed by the load (2 marks)

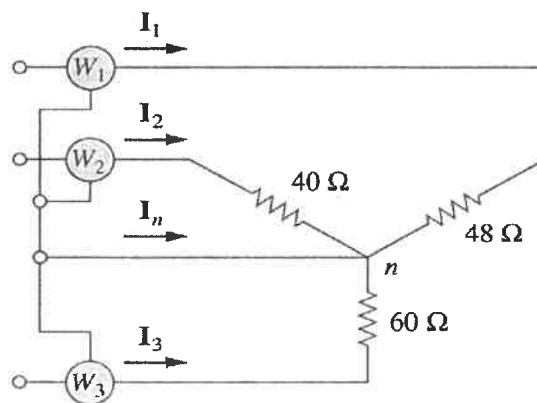


Figure 3

- (b) A parallel resonant circuit with quality factor 120 has a resonant frequency of 6×10^6 rad/s. Solve the following.
- the bandwidth, (2 marks)
 - the half-power frequencies, (4 marks)
 - the power dissipated at ω_0 , ω_1 and ω_2 given that $R = 8 \text{ k}\Omega$ and $V_m = 15 \text{ V}$. (4 marks)

Question 4

- (a) A 1-MVA substation operates at full load at 0.7 power factor. It is desired to improve the power factor to 0.95 by installing capacitors. Assume that new substation and distribution facilities cost RM 120 per kVA installed, and capacitors cost RM 30 per kVA installed. Calculate: -
- i. the cost of capacitors needed. (12 marks)
 - ii. the savings in substation capacity released. (3 marks)
- (b) The two-wattmeter method gives $P_1 = 1200 \text{ W}$ and $P_2 = -400 \text{ W}$ for a three-phase motor running on a 240-V line. Assume that the motor load is wye-connected and that it draws a line current of 6 A. Indicate the power factor and its phase impedance. (10 marks)

Question 5

- (a) Calculate I_o and the overall complex power supplied for the circuit in Figure 4.

(15 marks)

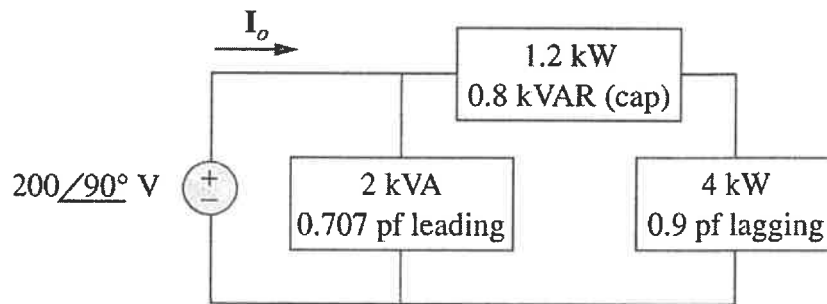


Figure 4

- (b) Solve the value of the voltage measured by the voltmeter and the power at 3Ω element in the circuit shown in Figure 5.

(10 marks)

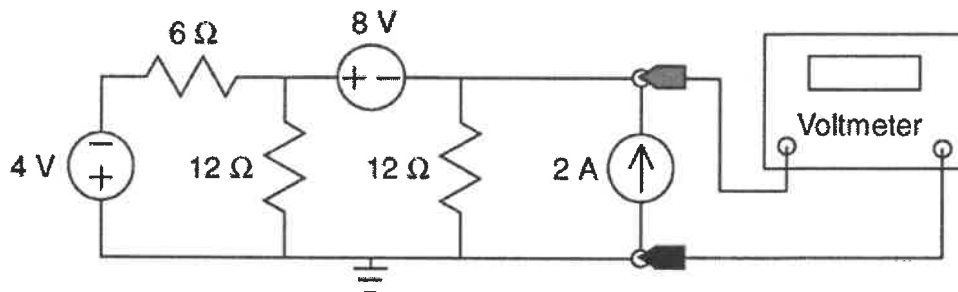


Figure 5

END OF EXAMINATION PAPER

