CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION

JULY 2025 SEMESTER SESSION

SUBJECT CODE	:	**LEB11403**
SUBJECT TITLE	:	**PRINCIPLES OF ELECTRICAL AND ELECTRONICS**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**BACHELOR OF ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY (MARINE) WITH HONOURS**
TIME / DURATION	:	**09.00 AM - 12.00 PM (3 HOURS)**
DATE	:	**24 DECEMBER 2025**

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 answer in 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

With reference to **Basic Electricity and Electronics.**

The electrical system of a marine navigation light uses a 24 V DC supply. A technician needs to verify the circuit operation and ensure the light meets maritime safety.

(a) State the unit of electric current, type of connection and its measuring instrument.

(3 marks)

(b) Identify **FOUR (4)** possible reasons the light might not turn on.

(4 marks)

(c) The circuit has **three identical lamps**, each with a resistance of 48 Ω, connected in parallel to the 24 V DC supply.

i. Sketch the circuit.

(3 marks)

ii. Calculate the total resistance and the total current drawn.

(6 marks)

(d) During an inspection, one lamp fails open circuit while the ship is sailing at night, As the duty engineer:-

i. Calculate the new total resistance and current drawn.

(4 marks)

ii. Calculate the total electrical power consumed by the lamp bank before and after the lamp failed.

(5 marks)

Question 2

With reference to **magnetism and Electromagnetism.**

(a) Define magnetic flux density and its SI unit.

(4 marks)

(b) Outline **THREE (3)** applications of permanent magnets in daily life or industry.

(6 marks)

(c) Consider a coil with an air core. The coil is 5 cm long and has 8 turns. When the switch is closed, a current of 5 A flows in it. Calculate:-

i. the magnetic field intensity, H.

(3 marks)

ii. the new magnetic field intensity if an iron core were slipped into the coil which having 5 cm long.

(3 marks)

iii. the new magnetic field intensity if the coil length remains the same, but the iron core is lengthened to 10 cm.

(3 marks)

(d) A coil of 100 turns links with a flux that increases uniformly from 0.3 Wb to 0.7 Wb in 0.5 seconds. Calculate:-

i. the induced voltage.

(3 marks)

ii. the new induced voltage if the flux decreases from 0.7 Wb to 0.2 Wb in 0.6 seconds.

(3 marks)

Question 3

With reference to **Introduction to Semiconductors.**

(a) Define semiconductor and **TWO (2)** examples of it.

(4 marks)

(b) A marine radar system requires a material with stable conductivity under varying temperatures. Describe **THREE (3)** reasons for the chosen element, silicon or germanium.

(6 marks)

(c) A silicon semiconductor diode has a barrier potential of 0.7 V. When forward biased with a supply voltage of 5 V through a 1 kΩ resistor, calculate:-

i. the voltage across the diode.

(2 marks)

ii. the current flowing through the circuit.

(4 marks)

iii. the power dissipated in the diode.

(3 marks)

(d) A germanium diode is placed with a 1 kΩ resistor across 9V. The diode has a maximum allowable power of 200 mW. Estimate whether this arrangement is safe.

(6 marks)

Question 4

With reference to **Boolean Algebra and Logic Simplification.**

(a) State **TWO (2)** commutative law for Boolean algebra.

(4 marks)

(b) Outline a truth table based on the min-term Boolean expression given below.

$$\bar{A}.\bar{B}.\bar{C} + \bar{A}.B.C + A.\bar{B}.\bar{C} = Y$$

(4 marks)

(c) Based on the expression in (b).

i. Illustrate the equivalent logic circuit for that expression.

(7 marks)

ii. Modify that expression to simplify it.

(4 marks)

(d) Based on the truth table in Figure 1, show a simplified expression using SOP simplification for the Boolean function.

A	*B*	*C*	*D*	*Y*
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

Figure 1

(6 marks)

Question 5

With reference to **Boolean Algebra and Logic Simplification.**

(a) State DeMorgan's theorems.

(4 marks)

(b) Outline a truth table based on the SOP expression given below.

$$Y = A\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + A\bar{B}CD + AB\bar{C}\bar{D} + ABC\bar{D}$$

(6 marks)

(c) Based on the expression in (b).

i. Modify that expression to simplify it.

(6 marks)

ii. Illustrate the equivalent logic circuit for simplified expression.

(3 marks)

(d) Using the Karnaugh map method, produce the product of sums (POS) expression for the function given below.

$$F(A, B, C, D) = \Sigma(1, 3, 4, 5, 6, 7, 9, 12, 13)$$

(6 marks)

END OF EXAMINATION PAPER