UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION

JULY 2025 SEMESTER SESSION

SUBJECT CODE	:	**LMD14103**
SUBJECT TITLE	:	**FUNDAMENTAL OF ELECTRICAL AND ELECTRONICS TECHNOLOGY**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**DIPLOMA OF ENGINEERING TECHNOLOGY IN MARINE ENGINEERING**
TIME / DURATION	:	**9.00 AM - 12.00 PM (3 HOURS)**
DATE	:	**22 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. This question paper consists of **TWO (2)** sections; Section A and Section B.
4. Answer **ALL** question in Section A, and **TWO (2)** questions **ONLY** in Section B.
5. Please write your answers on this answer booklet provided.
6. Answer **ALL** questions in English language **ONLY**.
7. Answer should be written in blue of black ink except for sketching, graphic and illustration.

THERE ARE 4 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

With reference to **Basic Electronics**:

During a class on Electronic Control Equipment for marine systems, the instructor presents examples of PLC-based automation, CPP control, and IACMS fuel monitoring.

(a) Explain the main components of a Programmable Logic Controller (PLC).

(6 marks)

(b) Describe the control functions of a Controllable Pitch Propeller (CPP) control system.

(8 marks)

(c) Explain the works of an Integrated Automation Control and Monitoring System (IACMS) integrates sensor on fuel tank monitoring.

(6 marks)

Question 2

With reference to **DC Circuits**:

A 48 V DC supply from the ship's auxiliary battery powers a navigation aid circuit consisting of:

- R_1 = 10 Ω in series (current-limiting resistor)
- R_2 = 20 Ω representing the radar display heater (parallel branch)
- R_3 = 30 Ω representing the electronic chart display cooling fan (parallel branch)

The chief engineer must assess load distribution and determine a replacement heater value that maintains a specified fan voltage.

(a) Identify the equivalent resistance of the circuit and the total current drawn from the 48 V battery.

(6 marks)

(b) Solve the followings:

i. The voltage across the parallel devices (radar heater and cooling fan).

(2 marks)

ii. The currents through R_2 and R_3.

(4 marks)

iii. The power dissipated by R_2.

(2 marks)

(c) If the radar display heater is replaced by new resistor value of R_2 so that the voltage across the cooling fan (R_3) becomes exactly 18 V, identify the new required value of this new resistor R_2.

(6 marks)

Question 3

With reference to **Magnetism**:

A ship's alternator operates based on electromagnetic induction principles.

(a) Describe Lenz's Law.

(6 marks)

(b) Explain the application of Lenz's Law in the operation of an AC generator on board ship.

(8 marks)

(c) A coil with 50 turns experiences a change in magnetic flux from 0.06 Wb to 0.02 Wb in 0.2 seconds. Solve for the polarity of the induced voltage according to Lenz's Law and its magnitude.

(6 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.
Please use the answer booklet provided.

Question 4

With reference to **AC Circuits**:

A ship's refrigeration motor draws 40 A at 230 V with a power factor of 0.7 lagging.

(a) Calculate the real power consumed.

(6 marks)

(b) Explain the undesirability of low power factor and its improvement using capacitors.

(8 marks)

(c) Calculate the apparent power and reactive power.

(6 marks)

Question 5

With reference to **AC Circuits**:

A ship's communication radio has an LC tuning circuit with L = 5 mH and C= 0.01 μF.

(a) Calculate the resonant frequency.

(6 marks)

(b) Explain the important of resonance in radio communication systems.

(8 marks)

(c) If the inductance is doubled, calculate the new resonant frequency.

(6 marks)

Question 6

With reference to **AC Circuits**:

A three-phase induction motor on board is supplied at 400 V, 50 Hz, drawing 30 A at 0.85 power factor.

(a) Calculate the real power output of the motor.

(6 marks)

(b) Explain the advantages of using three-phase power on ships compared to single-phase.

(8 marks)

(c) Calculate the apparent power and reactive power.

(6 marks)

END OF EXAMINATION PAPER