CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION

JULY 2025 SEMESTER SESSION (7-WEEK)

SUBJECT CODE	:	**LEB41303**
SUBJECT TITLE	:	**SHIP ELECTRICAL INSTALLATION**
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	:	**19 SEPTEMBER 2025**

INSTRUCTIONS TO CANDIDATES

1. Please **CAREFULLY** read 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** questions in Section A. For Section B, answer **THREE (3)** questions **ONLY**.
5. Please write your answers in the answer booklet provided.
6. Answer **ALL** questions in English language **ONLY**.

THERE ARE 7 PAGES OF QUESTIONS, EXCLUDING THIS COVER PAGE.

Section A (Total 40 marks)

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

Question 1

You are tasked with investigating and evaluating the integration and functionality of shipboard electrical systems in relation to navigation, propulsion, and engine monitoring. Using technical diagrams, analyze how these systems interconnect, identify critical components, and assess their roles in ensuring safe and efficient vessel operation.

(a) Explain the operational principles and roles of the following navigation systems used in shipboard electrical installations.

i. DGPS (Differential Global Positioning System)

(2 marks)

ii. Anemometer

(2 marks)

iii. Echo Sounder

(2 marks)

(b) Identify and describe FIVE (5) key equipment used in propulsion and engine monitoring systems onboard ships.

(5 marks)

(c) Describe the electrical system design considerations illustrated in Figure 1. Identify and justify the roles of components labeled A, B, C, D, and E in the context of ship electrical system planning.

(5 marks)

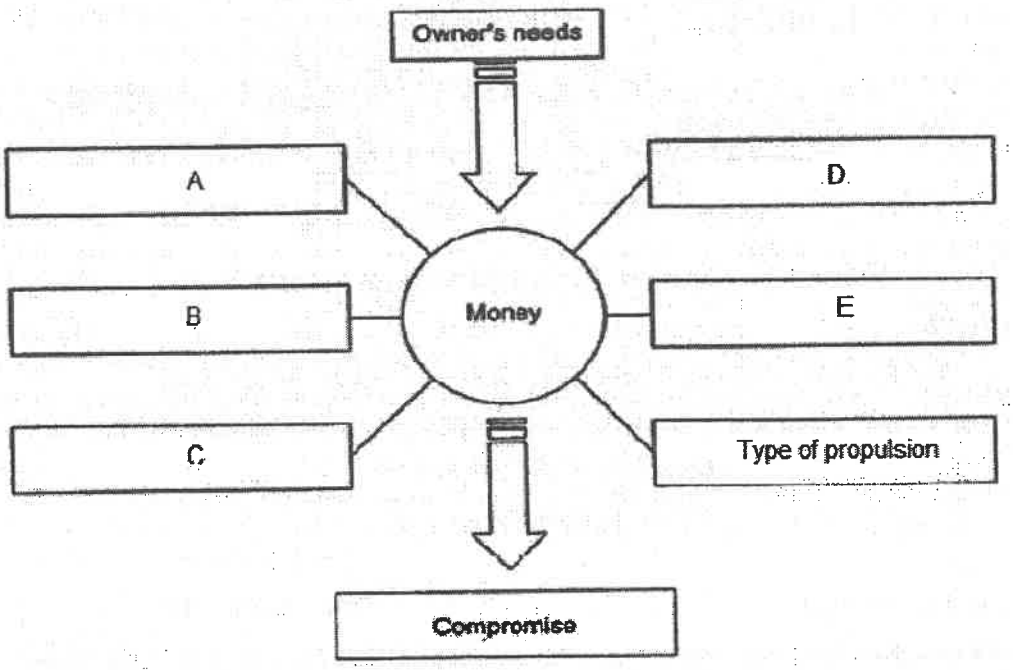

Figure 1

(d) Explain the recognized standard voltage and its phase for the following equipment.

i. Fixed lighting

(2 marks)

ii. Internal communication

(2 marks)

Question 2

You are tasked with investigating the behavior and reliability of shipboard electrical systems under normal and fault conditions. Your investigation should include synchronization techniques for alternators, configuration differences, fault analysis in a 3-phase delta system, and the impact of ship inclination on electrical equipment. Use diagrams, calculations, and technical reasoning to support your findings.

(a) State THREE (3) synchronization techniques for alternators.

(3 marks)

(b) State the main difference between a star configuration system and a delta configuration system.

(2 marks)

(c) A 3 phase system which is a delta delta configuration has 120 V at the source. One of the phases at the source has winding failed open (defect). With the aid of a diagram,

i. Show the circuit with suitable labelling.

(3 marks)

ii. Indicate the values of voltage at the load.

(3 marks)

(d) Explain the effects of inclination on electrical equipment on board ship.

(6 marks)

(e) Control devices is to maintain correct values of certain parameters. Identify these THREE (3) parameters.

(3 marks)

~~SECTION B (Total 60 marks)~~

INSTRUCTION: Answer THREE (3) questions only.
Please use the answer booklet provided

Question 3

You are assigned to investigate the operational integrity of a shipboard electrical distribution system involving parallel-connected generators. Your investigation should include synchronization parameters, reactive power calculations, and total busbar loading analysis. Use technical reasoning and calculations to support your findings.

(a) A shipboard distribution system consists of different component for distribution and safe operation of the system. They are ship generator consisting of prime mover and alternator. Main switch board which is a metal enclosure taking power from the diesel generator and supplying it to different machinery. Determine FOUR (4) main parameters to be observed during Synchronizing parallel connected generators.

(8 marks)

(b) Two generators are load sharing equally in parallel. Generator 1 delivers 500 kW at 0.8 power factor lag, and Generator 2 delivers 400 kW and 350 kVAr lag. Calculate:-

i. the kVAr loading of Generator 1.

(2 marks)

ii. the pf of Generator 2.

(4 marks)

iii. the total busbar loading in kW, kVAr and power factor.

(6 marks)

Question 4

You are assigned to investigate the procedures and equipment involved in connecting shore power to a ship while docked at harbor. Additionally, assess the differences between single-phase two-wire and three-wire systems in terms of design, functionality, and application. Your findings should demonstrate technical understanding and operational awareness..

(a) Carry out the procedures and prominent equipment for the shore supply to be connected to your ship when alongside harbor.

(15 marks)

(b) Determine the difference between single-phase two wire and single-phase three wire systems.

(5 marks)

Question 5

As a shipboard electrical engineer, you are tasked with investigating and designing a complete electrical power distribution system for a passenger liner. Your investigation should include the integration of high-voltage and low-voltage generators, switchboards, transformers, and various types of loads. Present your findings in the form of a detailed system diagram and explain the functional relationships between components.

(a) As an electrical engineer you are required to be conversant with ship electrical system. Produce a complete ship electrical system diagram for passenger liner which consists of the following datas:

i. High Voltage (HV) generator (4 nos) – 6.6 kV, 60 Hz
(4 marks)

ii. HV main switchboard – 6.6 kV, 60 Hz
(1 marks)

iii Low Voltage (LV) generator (1 no) – 440 V, 60 Hz
(2 marks)

iv. LV main switchboard – 440 V, 60 Hz
(2 marks)

v. Emergency generator (1 no) – 440 V, 60 Hz
(1 marks)

vi. Emergency switchboard – 440 V, 60 Hz
(2 marks)

vii. Transformers (2 no) – 440 V / 220 V, 60 Hz
(2 marks)

viii. Loads – operate at HV (2 nos)
(2 marks)

ix. Loads – operate at LV 220 V, 60 Hz (2 nos)
(2 marks)

x. Loads – supplied by emergency generator (2 nos)
(2 marks)

Question 6

As a shipboard electrical engineer, you are required to investigate the transition from traditional relay-based Power Management Systems (PMS) to modern PLC-based systems. Your investigation should include the functional purpose of PMS in ship electrical installations and identify key areas of integration. Additionally, analyze and design a shore supply arrangement for a vessel, presenting your findings with a labeled diagram.

(a) Power Management System (PMS) has in the past been relayed-based, but a programmable electronic system using a PLC is now commonly used.

i. Show the purpose of PMS from the ship electrical installation perspective.

(2 marks)

ii. Relate FOUR (4) elements where PMS can be employed and incorporated.

(8 marks)

(b) With the aid of the diagram, produce the shore supply arrangement with suitable labeling.

(10 marks)

END OF QUESTION PAPER