



**UNIVERSITI KUALA LUMPUR**  
**Malaysian Institute of Marine Engineering Technology**

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**FINAL EXAMINATION**  
**JULY 2025 SEMESTER SESSION**

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<b>SUBJECT CODE</b>	<b>: LEB22203</b>
<b>SUBJECT TITLE</b>	<b>: MARINE INSTRUMENTATION</b>
<b>PROGRAMME NAME</b> (FOR MPU: PROGRAMME LEVEL)	<b>: BACHELOR OF ENGINEERING TECHNOLOGY IN ELECTRICAL AND ELECTRONICS (MARINE) WITH HONOURS</b>
<b>TIME / DURATION</b>	<b>: 09.00 AM - 11.30 AM (2 HOURS 30 MINUTES)</b>
<b>DATE</b>	<b>: 15 DECEMBER 2025</b>

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**INSTRUCTIONS TO CANDIDATES**

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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 SIX (6) questions.
4. Answer **ALL** question in Section A, and **THREE (3)** questions in Section B.
5. Please write your answers on this answer booklet provided.
6. Answer **ALL** questions in English language **ONLY**.

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**THERE ARE 4 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.**

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**SECTION A (Total: 40 marks)**

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

**Question 1**

With reference to measurement and instrumentation:

- (a) List FOUR (4) key characteristics of measuring instruments. (4 marks)
- (b) "This error is mainly due to human mistakes in reading or in using instruments or errors in recording observations. Errors may also occur due to incorrect adjustment of instruments and computational mistakes".
- i. State the name of this error. (2 marks)
- ii. Identify TWO (2) ways to minimize this error. (2 marks)
- (c) Given the value of resistor used in motor vessel is  $2k\Omega$ ; however, the measurements yield a value of  $1.93k\Omega$ . Find the absolute error, percentage of error and percentage of accuracy. (6 marks)
- (d) A weighing scale has a resolution of  $0.01kg$  and uncertainty of  $\pm 0.02kg$ . Five measurements are recorded:  $10.02, 10.00, 9.98, 10.01, 9.99kg$ . Determine the mean and standard deviation. (6 marks)

**Question 2**

With reference to sensor technology:

- (a) Define accuracy and linearity in sensor performance. (4 marks)
- (b) List THREE (3) types of deck monitoring sensors. (3 marks)
- (c) With the aid of a diagram, explain how SONAR system works. (7 marks)
- (d) Describe THREE (3) critical sensors in an engine room monitoring system. (6 marks)

**SECTION B (Total: 60 marks)**

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

**Question 3**

With reference to instruments calibration:

- (a) Explain THREE (3) general calibration processes. (6 marks)

- (b) "Modern ships now utilize Computerized Maintenance Management Systems (CMMS) to facilitate and streamline ship management operations".

Discuss the role of a Shipboard CMMS in enhancing calibration management. (8 marks)

- (c) Elaborate the terms "suitable means", "portable atmosphere testing instruments" and "manufacturer's instructions" according to SOLAS Chapter XI-1, Regulation 7 on calibration practices on ships. (6 marks)

**Question 4**

With reference to Supervisory Control and Data Acquisition (SCADA) systems:

- (a) With the aid of a diagram, explain the components and layout of SCADA systems. (10 marks)

- (b) "In May 2021, the container ship MV X-Press Pearl caught fire near Colombo, Sri Lanka, after a nitric acid leak from a corroded container ignited nearby materials, leading to explosions on May 25 and the vessel's partial sinking on June 2".

Identify THREE (3) critical applications of SCADA in shipboard fire and gas detection systems. (4 marks)

- (c) Critique the challenges of integrating SCADA with legacy ship subsystems. (6 marks)

**Question 5**

With reference to fire and alarm detection systems:

- (a) Explain THREE (3) types of fire and alarm detection systems. (6 marks)
- (b) "During a fire emergency on a cargo ship, the Emergency Voice Alarm Communication System (EVACS) failed to deliver evacuation instructions".  
Investigate potential causes of this failure and propose corrective measures. (6 marks)
- (c) With the aid of a diagram, elaborate the structure of fire detection systems. (8 marks)

**Question 6**

With reference to oxygen and other gases detection systems:

- (a) Explain the purpose and importance of oxygen detection systems onboard ships. (6 marks)
- (b) Analyze the environmental and physical challenges associated in maintaining gas detection systems in marine environments. (6 marks)
- (c) "A ship's engine room exploded due to undetected accumulation of flammable gas".  
Referring to the above scenario, identify the likely failures in the gas detection system and suggest preventive strategies. (8 marks)

**END OF EXAMINATION PAPER**

