



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

---

**FINAL EXAMINATION**  
**MARCH 2025 SEMESTER SESSION**

---

**SUBJECT CODE** : LEB31103

**SUBJECT TITLE** : ELECTRONICS COMMUNICATION 1

**PROGRAMME NAME** : BACHELOR OF ELECTRICAL AND ELECTRONICS  
(FOR MPU: PROGRAMME LEVEL) ENGINEERING TECHNOLOGY (MARINE) WITH HONOURS

**TIME / DURATION** : 9.00 AM - 12.00 PM  
(3 HOURS)

**DATE** : 26 JUNE 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 **ONE (1)** section.
  4. Answer **FOUR (4)** questions **ONLY**.
  5. Please write your answer on the answer booklet provided.
  6. Answer all questions in English language only.
- 

**THERE ARE 6 PAGES OF QUESTIONS, INCLUDING THIS PAGE.**

---

**SECTION A (Total: 100 marks)**

**INSTRUCTION: Answer only FOUR (4) questions.**

**Please use the answer booklet provided.**

**Question 1**

**With reference to Introduction to Electronic Communication Systems:**

A new offshore support vessel (OSV) experiences intermittent data transmission failures between the engine control room and the bridge, especially during heavy equipment operations. As the shipboard electronics engineer, you are assigned to evaluate the ship's communication system for weaknesses and propose a suitable solution.

- (a) Illustrate a block diagram representing a basic communication system on board a ship with all major components clearly labelled.  
(CLO1, PLO2, C4, SK3, 10 marks)
- (b) Differentiate between analogue and digital communication systems in terms of noise immunity and application aboard ships.  
(CLO1, PLO2, C4, SP1, 8 marks)
- (c) Calculate the total attenuation (in dB) over a 100 m fiber optic cable with a rated loss of 0.3 dB/km and connector loss of 1.2 dB at each end.  
(CLO1, PLO2, C4, SP3, 3 marks)
- (d) Outline **TWO (2)** physical or environmental factors that can degrade signal quality in shipboard cable systems.  
(CLO1, PLO2, C4, SP3, 4 marks)

**Question 2**

**With reference to Antennas and Wave Propagation:**

You are the shipboard communication officer on a vessel experiencing poor long-range communication during a transoceanic voyage. You are tasked with diagnosing the antenna and propagation issues affecting signal quality and recommending improvements.

- (a) Compare ground wave, skywave, and space wave propagation in terms of their behavior and application in maritime environments.

(CLO3, PLO3, C3, SK3, 12 marks)

- (b) Differentiate between the near field and far field of an antenna.

(CLO3, PLO3, C3, SP1, 4 marks)

- (c) Identify **THREE (3)** possible environmental or structural factors that degrade antenna performance at sea.

(CLO3, PLO3, C3, SP3, 6 marks)

- (d) Determine the importance of return loss in antenna systems by identifying what a high return loss indicates about the system's performance.

(CLO3, PLO3, C3, SP1, 3 marks)

**Question 3**

With reference to **Spectrum, Noise and Modulation**:

During a GMDSS drill, the MF/HF radio signal was found to be weak and distorted. The radio technician suspects improper amplitude modulation as the root cause. The system operates at a carrier frequency of 1 MHz, with a modulating frequency of 2.5 kHz and carrier amplitude of 10 V.

- (a) Determine the effect of modulation index on the power distributed to the sidebands in an amplitude modulated (AM) signal.  
(CLO3, PLO3, C3, SK3, 6 marks)
  
- (b) Calculate the total transmitted power if the carrier power is 100 W and the modulation index is 0.8.  
(CLO3, PLO3, C3, SP3, 4 marks)
  
- (c) Differentiate baseband from broadband transmission; select the appropriate type for long-distance maritime voice communication.  
(CLO3, PLO3, C3, SP1, 6 marks)
  
- (d) Illustrate AM spectrum showing carrier at 1 MHz, sidebands at  $\pm 2.5$  kHz, amplitudes based on carrier amplitude of 10 V with modulation index 0.8.  
(CLO3, PLO3, C3, SP3, 8 marks)

**Question 4**

With reference to **Spectrum, Noise and Modulation**:

The vibration sensor monitoring the ship's engine is transmitting inaccurate data to the bridge. The FM system uses a 20 MHz carrier, with a deviation of 10 kHz and a modulating frequency of 5 kHz. The engineer suspects improper bandwidth planning and modulation.

- (a) Outline the differences between carrier frequency and modulating frequency in FM transmission.  
(CLO3, PLO3, C3, SK3, 4 marks)
- (b) Determine the modulation index, including its impact on signal fidelity.  
(CLO3, PLO3, C3, SP1, 4 marks)
- (c) Calculate the required FM bandwidth. Illustrate frequency spectrum using the Bessel function table shown in Table 1 by labelling frequency values and amplitudes.  
(CLO3, PLO3, C3, SP3, 13 marks)
- (d) Compare AM performance to FM performance in the engine room based on noise immunity and reliability.  
(CLO3, PLO3, C3, SP3, 4 marks)

Table 1: Bessel Function Table

Modulating Index m	Carrier J <sub>0</sub>	Sideband Frequency Pair (n)						
		J <sub>1</sub>	J <sub>2</sub>	J <sub>3</sub>	J <sub>4</sub>	J <sub>5</sub>	J <sub>6</sub>	J <sub>7</sub>
0.00	1.00	-	-	-	-	-	-	-
0.25	0.98	0.12	-	-	-	-	-	-
0.50	0.94	0.24	0.03	-	-	-	-	-
1.00	0.77	0.44	0.11	0.02	-	-	-	-
1.50	0.51	0.56	0.23	0.06	0.01	-	-	-
2.00	0.22	0.58	0.35	0.13	0.03	-	-	-
2.50	-0.05	0.50	0.45	0.22	0.07	0.02	-	-
3.00	-0.26	0.34	0.49	0.31	0.13	0.04	0.01	-

**Question 5**

**With reference to Applications of Communication System:**

A cargo ship navigating in the North Atlantic faces signal delays and dropped connections in its satellite and telephone systems.

- (a) Determine the roles of uplink, downlink, and transponder processes in contributing to satellite communication delays.

(CLO3, PLO3, C3, SK3, 6 marks)

- (b) Identify the type of orbit that would minimize latency in this scenario and justify your choice.

(CLO3, PLO3, C3, SP1, 4 marks)

- (c) Compare single-mode fiber with multimode fiber in terms of performance versus cost for satellite integration onboard.

(CLO3, PLO3, C3, SP3, 8 marks)

- (d) Differentiate the phases of telephone signaling during a ship-to-port call by identifying call establishment, control, and termination processes.

(CLO3, PLO3, C3, SP3, 6 marks)

**END OF EXAMINATION PAPER**

