UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION
JULY 2025 SEMESTER SESSION (7-WEEK)

SUBJECT CODE : **LEB31303**

SUBJECT TITLE : **DIGITAL SIGNAL PROCESSING**

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

TIME / DURATION : **09.00AM - 12.00PM**
(3 HOURS)

DATE : **17 SEPTEMBER 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 FIVE (5) questions.

4. Answer **FOUR (4)** questions **ONLY**.

5. Please write your answers in the answer booklet provided.

6. Answer **ALL** questions in English language **ONLY**.

7. Answer should be written in blue or black ink except for sketching, graphic and illustrations.

THERE ARE 3 PAGES OF QUESTIONS, INCLUDING THIS COVER PAGE.

INSTRUCTION: Answer FOUR (4) questions only.

Please use the answer booklet provided.

Question 1

(a)   Sketch the basic block diagrams of a digital signal processing system (DSP) with complete labels.

(10 marks)

(b)   Explain the block diagram of a digital signal processing system (DSP) in (a).

(15 marks)

Question 2

(a)   Explain the properties of a system.

(10 marks)

(b)   Define time invariant systems

(7 marks)

(c)   Explain the meaning of LTI system.

(8 marks)

Question 3

(a)   Differentiate between DFT and DTFT

(7 marks)

(b)   Explain the difference and similarities between DIF and DIT algorithms.

(10 marks)

(c)   Explain how to avoid aliasing in DSP.

(8 marks)

Question 4

(a)   Distinguish between IIR and FIR filters.

(4 Marks)

(b)   Write the steps in designing Chebyshev filter

(8 Marks)

(c)   Write down the steps for designing a Butterworth filter.

(7 marks)

(d)   Explain how to design a digital filter from analog filter.

(6 marks)

Question 5

A discrete-time signal is defined as:

$$x[n] = \begin{cases} 1, & n = 0 \\ 0.5, & n = 1 \\ 0, & otherwise \end{cases}$$

Given that DTFT of $x[n]$ is:

$$X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x[n]\, e^{-j\omega n}$$

(a)   Derive the DTFT expression $X(e^{j\omega})$ for this signal.

(15 marks)

(b)   Sketch the magnitude spectrum $\left| X(e^{j\omega}) \right|$ over $-\pi \leq \omega \leq \pi$.

(10 marks)

END OF EXAMINATION PAPER