



**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>: LED12002</b>
<b>SUBJECT TITLE</b>	<b>: TECHNICAL MATHEMATICS 1</b>
<b>PROGRAMME NAME</b> (FOR MPU: PROGRAMME LEVEL)	<b>: DIPLOMA OF ENGINEERING TECHNOLOGY IN ELECTRICAL AND ELECTRONICS (MARINE)</b>
<b>TIME / DURATION</b>	<b>: 09.00 AM - 11.30 AM (2 HOURS 30 MINUTES)</b>
<b>DATE</b>	<b>: 20 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 **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 or black ink except for sketching, graphic and illustration.
  8. Formulae sheet has been appended for your reference.
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**THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.**

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## PART A (Total: 60 marks)

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

## Question 1

With reference to Calculations with Indices and Logarithms:

(a) Express  $\log_a(b^2c) + \log_a\left(\frac{b}{c}\right)$  in term of  $\log_a b$  and  $\log_a c$ .

(5 marks)

(b) Simplify the following expression using law of indices:

i. 
$$\frac{4a^4b^3 \times 6a^2b^4}{16a^5b^4}$$

(4 marks)

ii. 
$$\frac{a^5b^7}{a^3b^4} \div \frac{a^4b^6}{a^5b^8}$$

(4 marks)

(c) Solve the equation  $\log_{10}(3x + 2) - 2\log_{10}x = 1 - \log_{10}(5x - 3)$ .

(7 marks)

**Question 2**

With reference to Calculations with Algebraic:

- (a) Write the phrase as algebraic expression:
- i. Four more than twice a number gives twelve. (1 mark)
  - ii. The difference between a number and five is equal to three times the number. (1 mark)
  - iii. The square of a number minus ten equals six. (1 mark)
  - iv. If you triple a number and subtract seven, the result is eight. (1 mark)
  - v. Half of the sum of a number and two is equal to ten. (1 mark)

- (b) The quantities of Steel Grade A(x) and Steel Grade B(y) are represented by the following simultaneous equations:

$$5x + 3y = 41$$

$$2x + 2y = 20$$

The coefficients in the equations represent the material usage rates in tons per specific section of the ship. Solve above system using elimination method.

(6 marks)

- (c) By using graph paper, draw the function of  $y = 2x^2 - 8x + 6$ .

(9 marks)

## Question 3

With reference to Calculations with Polynomial:

- (a) Given  $P(x) = 5x^5 - 6x^4 + 4x^3 - 3x^2 + 7x - 9$  and  $D(x) = x - 3$ . Find the division,  $P(x) \div D(x)$ .

(6 marks)

- (b) Figure 1 shows a shaped region with side lengths labelled in terms of  $x$ . Find the area of the shaded region as a simplified algebraic expression in  $x$ .

(6 marks)

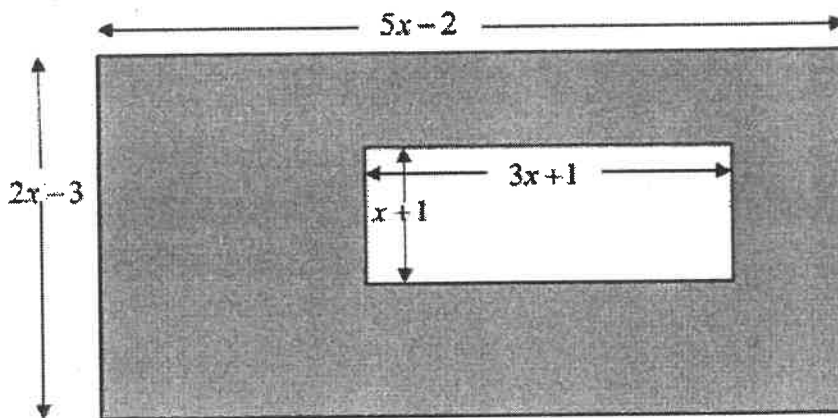


Figure 1

- (c) Factorize  $f(x)$  as far as possible if given  $f(x) = x^3 - 7x - 6$ .

(8 marks)

**PART B (Total: 40 marks)****INSTRUCTION: Answer TWO questions.****Please use the answer booklet provided.****Question 4**

With reference to Calculations with Matrices:

Given the following system of linear equations:

$$2x + 3y - z = 1$$

$$4x + y - 3z = 11$$

$$3x - 2y + 5z = 21$$

- (a) Rewrite the above system in matrix form.

(2 marks)

- (b) Find the values of
- $x$
- ,
- $y$
- and
- $z$
- to solve this linear equation system.

(18 marks)

**Question 5**

With reference to Calculations with Complex Number:

- (a) Show that
- $i^{245}$
- simplifies to
- $i$
- .

(4 marks)

- (b) Given three different forms of complex numbers,
- $Z_1 = 5e^{2.8i}$
- ,
- $Z_2 = 4\angle 70^\circ$
- and
- $Z_3 = 2(\cos(30^\circ) + i\sin(30^\circ))$
- .

- i. Calculate
- $Z = Z_1 - Z_2 - Z_3$
- and leave your answer in trigonometry form.

(13 marks)

- ii. Hence, use De Moivre's theorem to determine
- $Z^5$
- .

(3 marks)

Question 6

With reference to Calculations with Complex Number:

Figure 2 shows the complex numbers  $Z_1, Z_2, Z_3$  and  $Z_4$  on an Argand diagram.

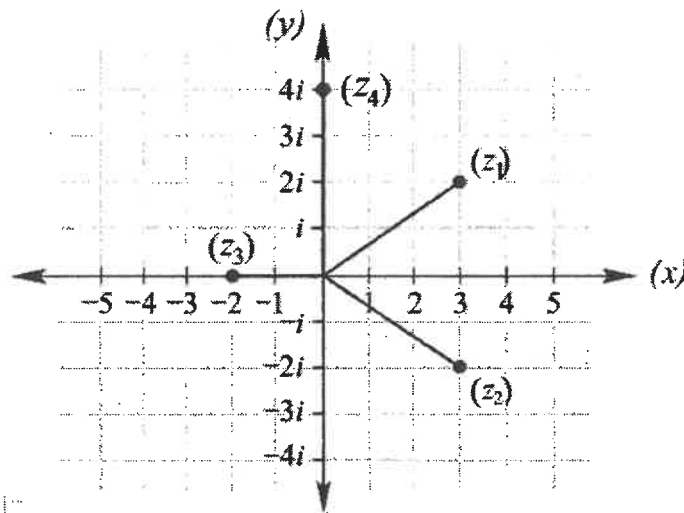


Figure 2

- (a) Express the conjugation of complex numbers  $Z_1, Z_2$  and  $Z_3$ . (3 marks)
  
- (b) Calculate  $A = 6Z_4 - Z_3 - Z_1Z_2$  and determine the real part and imaginary part of  $A$ . (7 marks)
  
- (c) Solve  $D = \frac{\bar{Z}_1}{4-2i} + \frac{-2+i}{Z_2}$  and leave your answer in  $a + ib$  form. (10 marks)

END OF EXAMINATION PAPER



## FORMULA SHEET

## ALGEBRA

## QUADRATIC FORMULA

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

## TRIGONOMETRY

## LAW OF SINE

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

## LAW OF COSINE

$$a^2 = b^2 + c^2 - 2bc \cos A$$

## COMPLEX NUMBER

POWER OF  $i$ 

$$i = \sqrt{-1}$$

$$i^2 = -1$$

$$i^3 = -i$$

$$i^4 = 1$$

## ALGEBRAIC FORM

$$Z = a + bi$$

## TRIGONOMETRIC FORM

$$Z = r(\cos \theta + i \sin \theta)$$

## POLAR FORM

$$Z = r \angle \theta$$

## EXPONENTIAL FORM

$$Z = re^{i\theta}$$

<b>DE MOIVRE</b>
<b>TRIGONOMETRIC FORM</b>
$z^n = [r(\cos\theta + i\sin\theta)]^n = r^n(\cos n\theta + i\sin n\theta).$
$\sqrt[n]{W} = W_0 = \sqrt[n]{r} \left( \cos \frac{\theta^\circ}{n} + i \sin \frac{\theta^\circ}{n} \right)$ $\sqrt[n]{W} = W_1 = \sqrt[n]{r} \left( \cos \frac{\theta^\circ + 360^\circ}{n} + i \sin \frac{\theta^\circ + 360^\circ}{n} \right)$
<b>POLAR FORM</b>
$Z^n = [r \angle \theta]^n = r^n \angle n\theta$
$\sqrt[n]{W} = W_0 = \sqrt[n]{r} \angle \frac{\theta^\circ}{n}$ $\sqrt[n]{W} = W_1 = \sqrt[n]{r} \angle \frac{\theta^\circ + 360^\circ}{n}$
<b>EXPONENTIAL FORM</b>
$Z^n = [r e^{i\theta}]^n = r^n e^{in\theta}$
$\sqrt[n]{W} = W_0 = \sqrt[n]{r} \angle e^{i\theta/n}$ $\sqrt[n]{W} = W_1 = \sqrt[n]{r} \angle e^{i(\theta+360^\circ)/n}$