CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION

JULY 2025 SEMESTER SESSION

SUBJECT CODE	:	**LMD13602**
SUBJECT TITLE	:	**TECHNICAL MATHEMATICS 1**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**DIPLOMA OF ENGINEERING TECHNOLOGY IN MARINE ENGINEERING**
TIME / DURATION	:	**09.00 AM - 11.30 AM (2 HOURS 30 MINUTES)**
DATE	:	**20 DECEMBER 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 **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.

THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

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 $log_a(b^2c) + log\left(\frac{b}{c}\right)$ 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 $log_{10}(3x+2) - 2log_{10}x = 1 - log_{10}(5x-3)$.

(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)

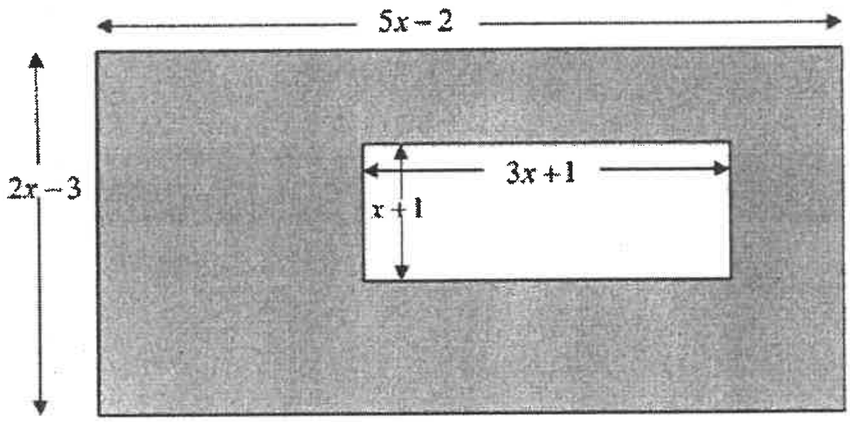

Figure 1

(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} is simplifies to i.

(4 marks)

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

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.

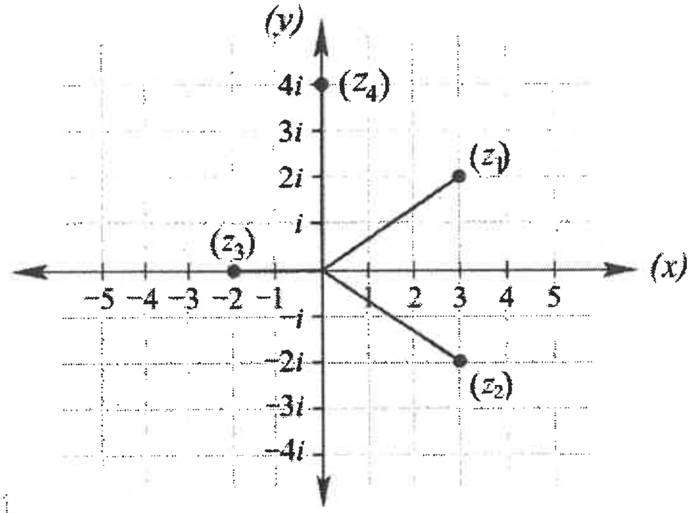

Figure 2

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

TRIGONOMETRY

LAW OF SINE	LAW OF COSINE
$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$	$a^2 = b^2 + c^2 - 2bcCosA$

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
$Z = re^{i\theta}$

DE MOIVRE
TRIGONOMETRIC FORM
$z^n = [r(\cos\theta + i\sin\theta)]^n = r^n(\cos n\theta + i\sin n\theta).$
$\sqrt{W} = W_o = \sqrt{r}(\cos\frac{\theta^o}{2} + i\sin\frac{\theta^o}{2})$ $\sqrt{W} = W_1 = \sqrt{r}(\cos\frac{\theta^o + 360^\circ}{2} + i\sin\frac{\theta^o + 360^\circ}{2})$
POLAR FORM
$Z^n = [r\angle\theta]^n = r^n\angle n\theta$
$\sqrt{W} = W_o = \sqrt{r}\angle\frac{\theta^o}{2}$ $\sqrt{W} = W_1 = \sqrt{r}\angle\frac{\theta^o + 360^\circ}{2}$
EXPONENTIAL FORM
$Z^n = [re^{i\theta}]^n = r^n e^{i\theta n}$
$\sqrt{W} = W_o = \sqrt{r}\angle e^{i\theta/2}$ $\sqrt{W} = W_1 = \sqrt{r}\angle e^{i\frac{\theta+360^\circ}{2}}$