CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION
FEBRUARY 2025 SEMESTER SESSION

SUBJECT CODE	:	**LMD12503**
SUBJECT TITLE	:	**TECHNICAL MATHEMATICS 1**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**DIPLOMA OF ENGINEERING TECHNOLOGY IN MARINE ENGINEERING**
TIME / DURATION	:	**9.00 AM – 11.30 AM (2 HOURS 30 MINUTES)**
DATE	:	**3 JULY 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 TWO (2) Sections; Section A and Section B.
4. Answer ALL questions in Section A. For Section B, answer TWO (2) questions.
5. Please write your answers on 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 illustration.
8. Formulae sheet has been appended for your reference.

THERE ARE 6 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A: 60 marks

INSTRUCTION: Answer ALL questions.

Question 1

With reference to Positive and Negative Integers, Ratios, Fraction and Decimals;

(a) Show which of the following is true proportion:

i. $\frac{5}{7} = \frac{35}{49}$.

(2 marks)

ii. $\frac{13}{15} = \frac{52}{60}$.

(2 marks)

iii. $\frac{6}{7} = \frac{35}{42}$.

(2 marks)

(b) Solve the following proportion:

i. Two numbers are respectively 30% and 70% more than a third number. Find the ratio of the two numbers.

(4 marks)

ii. Salaries of Ali and Abu as engineer are in the ratio 2 : 3. If the salary of each is increased by RM 8000, the new ratio become 40 : 57. Determine the Ali's salary.

(6 marks)

(c) Show the **manual** calculation of $92.67 \div 2.5 \times 6.1$ and round the answer to two significant figures.

(4 marks)

Question 2

With reference to Algebraic;

(a) Write the phrase as algebraic expression:

i. Take away x from z and the answer is six.

(1 mark)

ii. Seven less than three times a number is the same as zero.

(1 mark)

iii. The product of two and the square of a number, then decreased by four.

(1 mark)

iv. When eight is added to two times a number and the answer is 14.

(1 mark)

v. The sum of nine and x, divided by four is equal to three times y.

(1 mark)

(b) Given the following equations, rewrite k as a subject.

i. $\frac{8k}{2m} = k - 1.$

(3 marks)

ii. $2m = \left(\sqrt{3k^2 + 4} - 9n\right)^2.$

(4 marks)

(c) Sketch the graph of parabola $f(x) = x^2 - 6x + 5$ using graph paper.

(8 marks)

Question 3

With reference Simultaneous Equation and Polynomial;

(a) Solve the following simultaneous equation by using substitution method:

$$x - 2y = 6$$
$$8x - 4y = 3$$

(7 marks)

(b) Determine the root of x for $x^2 - 6x + 5 = 0$ using quadratic formula.

(7 marks)

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

(6 marks)

SECTION B: 60 marks

INSTRUCTION: Answer TWO (2) QUESTIONS only

Question 4

With reference to Matrices;

Given the following system of equation:

$$x - 2y - 5z = 6$$
$$2x - y + 4z = 3$$
$$5x + 3y + z = 1$$

(a) Change the system into the matrix form.

(6 marks)

(b) Calculate the determinant of D, D_X, D_Y and D_Z.

(8 marks)

(c) Find the value of *X*, *Y* and Z.

(6 marks)

Question 5

With reference to Complex Number;

(a) In an electrical circuit design, the current flows is represented by the expression $3a - (5b)j = (5 - 3j)(8 + 2j) - (2 - j)$ where a and b are parameters of an electronic components. Determine the values of a and b.

(10 marks)

(b) Compute the following complex number operations and leave the answer in polar form.

$$5(cos40^\circ + isin40^\circ) + (3 - 4i) - 7\angle 25^\circ$$

(10 marks)

Question 6

With reference Matrices and Complex Number;

(a) The stress measurements (in MPa) at three different points A, B, and C on two different structural components at two different times are represented by the following matrices:

$$A = \begin{bmatrix} 3 & 4 \\ 2 & 7 \end{bmatrix}, \quad B = \begin{bmatrix} 2 & 6 \\ 1 & 5 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 3 \\ 1 & 2 \end{bmatrix}$$

Calculate:

i. $(A + B) + (B - C)$.

(3 marks)

ii. Determinant *A* and *B*.

(3 marks)

iii. $2B - C^2$.

(4 marks)

(b) In an electronic communication system, the system includes a network of resistances connected in series, denoted by $W = 2 - 8i$ and $Z = -5 - i$.

i. Plot W and Z in Argand Diagram.

(3 marks)

ii. Determine the conjugation of Y is given $Y = \frac{WZ}{3-4j}$.

(7 marks)

END OF EXAMINATION PAPER

FORMULA SHEET

ALGEBRA

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

TRIGONOMETRY

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

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