CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION

JULY 2025 SEMESTER SESSION

SUBJECT CODE	:	**LEB11303**
SUBJECT TITLE	:	**ENGINEERING MATHEMATICS 1**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**BACHELOR OF ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY (MARINE) WITH HONOURS**
TIME / DURATION	:	**09.00 AM - 12.00 PM (3 HOURS)**
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)** parts; Part A and Part B.
4. Answer **ALL** question in Part A, and **THREE (3)** questions **ONLY** in Part 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. Formula is appended for your reference.

THERE ARE 7 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

PART A (Total: 40 marks)

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

Question 1

With reference to Calculations with Basic Numbers and Algebra Expression:

(a) Write an algebraic expression for the following words problem:

i. The sum of the temperatures T_1 and T_2 is divided by two to give the average temperature T_{avg}. This average is then multiplied by the square root of three.

(3 marks)

ii. The sum of the lengths of two steel rods *L1* and *L2* is multiplied by the density ρ and the cross sectional area *A* to obtain the total mass *M*. Then, this mass is reduced by 5% for cutting allowance.

(3 marks)

(b) Given $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$, R_2. Express R_2 in terms of R and R_1.

(3 marks)

(c) Describe the formula of increasing and decreasing percentage.

(4 marks)

(d) Salaries of Ravi and Sumit are in the ratio 2: 3. If the salary of each is increased by RM 4000, the new ratio becomes 40: 57. Find the Sumit's salary.

(7 marks)

Question 2

With reference to Calculation with Linear Functions, Quadratic Function and Polynomial:

(a) Determine $P(x) \div D(x)$ if given $P(x) = -10x^4 - 6x^3 + 2x^2 + 8x + 3$ and $D(x) = 2x^2 + 2x + 2$ using long division techniques.

(6 marks)

(b) Given $f(x) = 2(x-3)^2 - 4$, draw the function of $f(x)$ using vertex formulas. Use the given graph paper.

(7 marks)

(c) Find the area of shaded region as shown in Figure 1 below.

(4 marks)

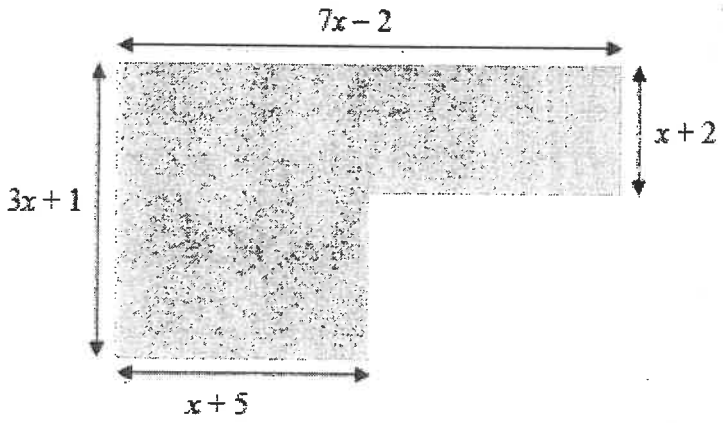

Figure 1

PART B (Total: 60 marks)

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

Question 3

With reference to Calculations with Matrices:

Given the system of linear equations:

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

(a) Express the system into the matrix form.

(2 marks)

(b) Determine the determinants as follows:

i. D and D_x using diagonal multiplication.

(6 marks)

ii. D_y and D_z using cofactor expansion.

(6 marks)

(c) Hence, calculate the value of x, y and z.

(6 marks)

Question 4

With reference to Calculations with Trigonometry:

(a) Figure 2 below shows a flagpole, BD held by two ropes, AD and CD. ABC is a straight line and angle $BD = 90°$. .

i. Show that the height of the flagpole BD is $13.3\ m$.

(2 marks)

ii. Find the area of triangle ACD.

(3 marks)

iii. Determine six trigonometry functions of triangle BCD.

(5 marks)

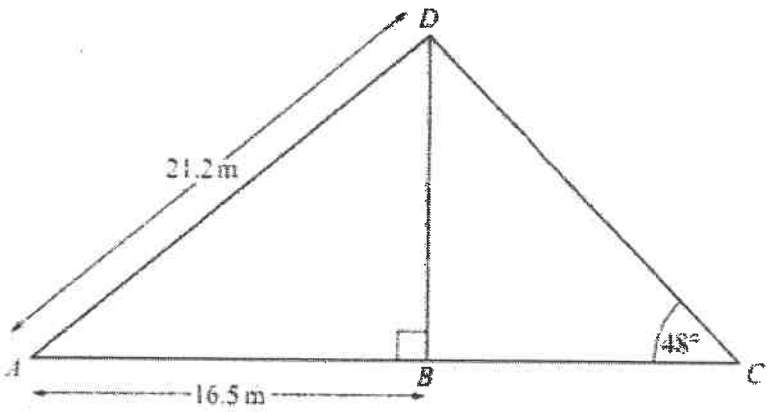

Figure 2

(b) Figure 3 below shows a quadrilateral $ABCD$ and E is a point on CD.

i. Determine the length of AC in cm.

(6 marks)

ii. Calculate the total area of quadrilateral $ABCD$.

(8 marks)

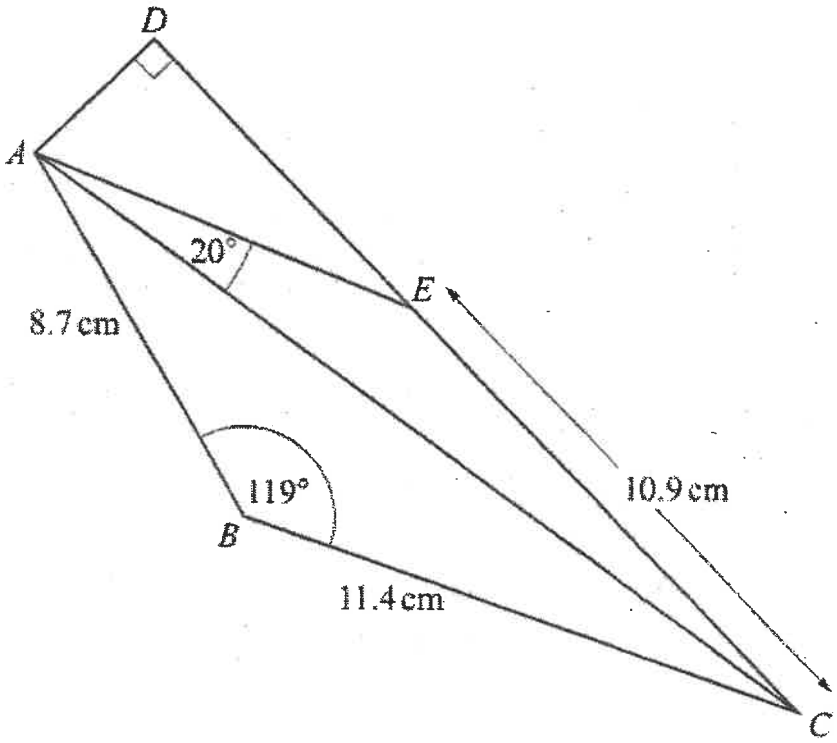

Figure 3

Question 5

With reference to Calculations with Mensuration:

Based on Figure 4 below, the shape consists of several parts including a trapezium with a height of 4 units and a semicircle with a diameter of 6 units. Use the given dimension, calculate the following:

i. perimeter of the shape.

(8 marks)

ii. area of the shape.

(12 marks)

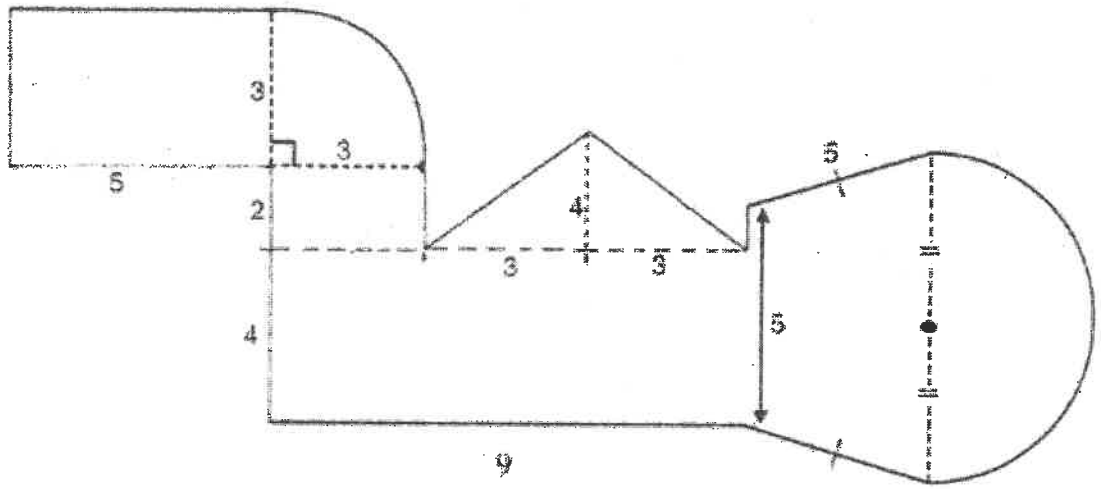

Figure 4

Question 6

With reference to Calculations with Mensuration and Trigonometry:

(a) Figure 5 below shows the net of a cuboid with its base shaded. Find the perimeter of the shaded region. The length of the cuboid is $10\ cm$, its width is $4\ cm$ and its height is $5\ cm$.

i. Sketch the three dimensional shaped and write down the values of a, b, c and d.

(6 marks)

ii. Calculate the surface area of the cuboid.

(6 marks)

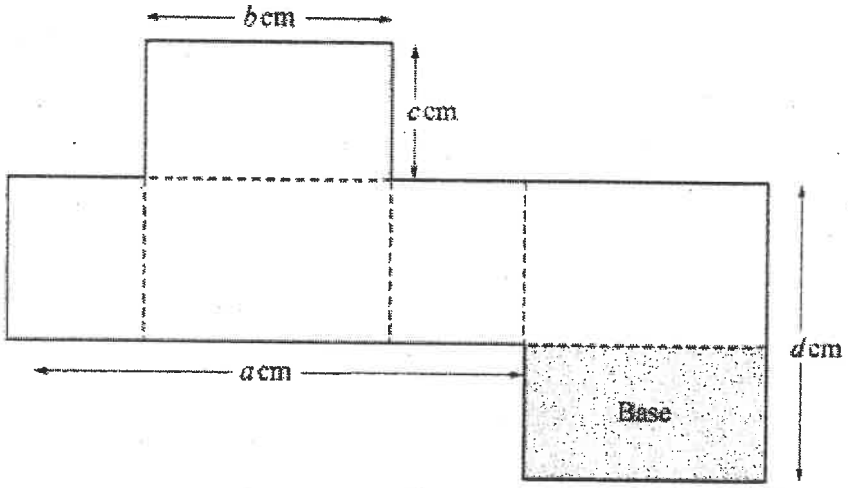

Figure 5

(b) A flagpole is $50\ m$ from a school building. From a window in the school the angle of elevation to the top of the flagpole is 35°, while the angle of depression to the base of the flagpole is 25°. Determine the tall of the flagpole.

(8 marks)

END OF EXAMINATION PAPER

FORMULA SHEET

TRIGONOMETRY IDENTITIES

FUNDAMENTAL IDENTITIES	FORMULAS FOR NEGATIVES
$\csc\theta = \frac{1}{\sin\theta}$	$\sin(-\theta) = -\sin\theta$
$\sec\theta = \frac{1}{\cos\theta}$	$\cos(-\theta) = \cos\theta$
$\cot\theta = \frac{1}{\tan\theta} = \frac{\cos\theta}{\sin\theta}$	$\tan(-\theta) = -\tan\theta$
$\cos^2\theta = \frac{1}{2}(1+\cos 2\theta)$	$\csc(-\theta) = -\csc\theta$
$\sin^2\theta + \cos^2\theta = 1$	$\sec(-\theta) = \sec\theta$
$1 + \tan^2\theta = \sec^2\theta$	$\cot(-\theta) = -\cot\theta$
$1 + \cot^2\theta = \csc^2\theta$	$\sin^2\theta = \frac{1}{2}(1-\cos 2\theta)$

ADDITION FORMULAS	SUBTRACTION FORMULAS
$\sin(A+B) = \sin A\cos B + \cos A\sin B$	$\sin(A-B) = \sin A\cos B - \cos A\sin B$
$\cos(A+B) = \cos A\cos B - \sin A\sin B$	$\cos(A-B) = \cos A\cos B + \sin A\sin B$
$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A\tan B}$	$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A\tan B}$

HALF-ANGLE FORMULAS	DOUBLE-ANGLE FORMULAS
$\sin\frac{\theta}{2} = \pm\sqrt{\frac{1-\cos\theta}{2}}$	$\sin 2\theta = 2\sin\theta\cos\theta$
$\cos\frac{\theta}{2} = \pm\sqrt{\frac{1+\cos\theta}{2}}$	$\cos 2\theta = \cos^2\theta - \sin^2\theta$ $\ldots\ldots = 1 - 2\sin^2\theta$ $\ldots\ldots = 2\cos^2\theta - 1$
$\tan\frac{\theta}{2} = \frac{1-\cos\theta}{\sin\theta} = \frac{\sin\theta}{1+\cos\theta}$	$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

PRODUCT-TO-SUM FORMULAS	SUM-TO-PRODUCT FORMULAS
$\sin\alpha\cos\beta = \frac{1}{2}[\sin(\alpha+\beta) + \sin(\alpha-\beta)]$	$\sin\alpha + \sin\beta = 2\sin\frac{\alpha+\beta}{2}\cos\frac{\alpha-\beta}{2}$
$\cos\alpha\sin\beta = \frac{1}{2}[\sin(\alpha+\beta) - \sin(\alpha-\beta)]$	$\sin\alpha - \sin\beta = 2\cos\frac{\alpha+\beta}{2}\sin\frac{\alpha-\beta}{2}$
$\cos\alpha\cos\beta = \frac{1}{2}[\cos(\alpha+\beta) + \cos(\alpha-\beta)]$	$\cos\alpha + \cos\beta = 2\cos\frac{\alpha+\beta}{2}\cos\frac{\alpha-\beta}{2}$

GEOMETRY AND MENSURATION

AREA	GENERAL FORM
TRAPEZIUM	$A = \frac{1}{2}(b_2 + b_1)h$
TRIANGLE	$A = \frac{1}{2}\, b\, h$
CIRCLE	$A = \pi r^2$
PARALLEOGRAM	$A = b\, h$

VOLUME	GENERAL FORM
CYLINDER	$V = \pi r^2 h$
PRISM	$V = A\, h$
SPHERE	$V = \frac{4}{3}\pi r^3$
CONE	$V = \frac{1}{3}\pi r^2 h$