CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION
OCTOBER 2025 SEMESTER SESSION

SUBJECT CODE	:	**LGB13503**
SUBJECT TITLE	:	**ENGINEERING MATHEMATICS 1**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**BET IN (OFFSHORE) WITH HONOURS** **BET IN (NAVAL ARCHITECTURE AND SHIPBUILDING) WITH HONOURS**
TIME / DURATION	:	**2.00 PM - 5.00 PM** **(3 HOURS)**
DATE	:	**26 JANUARY 2026**

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)** section; Section A and Section B.
4. Answer **ALL** question Section A, and **THREE (3)** 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. Formula is appended for your reference.

THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS COVER PAGE

PART A (Total: 40 marks)

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

Question 1
With reference to Calculations with Algebra Expression and Polynomial.

(a) Given that the sum of two positive integer numbers is 8 and the sum of the square of these two numbers is 40.

i. Write two equations if these two numbers are x and y respectively.

(3 marks)

ii. Solve the equation in 1(a)i.

(5 marks)

(b) The sum of two positive integers is 12 and the product of these two integers is 32. Find the integers.

(7 marks)

(c) Let $P(x) = x^3 - 5x^2 - 18x + 72$. Find number '$a$' so that $P(a) = 0$.

(5 marks)

Question 2

With reference to Calculations with Complex Numbers.

(a) Solve the following operation and give the answer in $a+ib$.

i. $(3+6i)+(2-3i)$.

(2 marks)

ii. $(4+2i)(6+7i)$.

(3 marks)

iii. $\dfrac{6-9i}{5+2i}$.

(3 marks)

(b) Given the complex number $z=1-i$. Use De Moivre's Theorem to determine z^{10}.

(12 marks)

PART B (Total: 60 marks)

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

Question 3

With reference to Calculations with Exponents, Logarithms and Hyperbolic Functions.

(a) Simplify each of the following:

i. $5^{4n+2} \div 125^{1-n} \text{ x } 25^{2n}$.

(5 marks)

ii. $3\log_4 8 + \log_4 6 - 3$.

(8 marks)

(b) Solve the equation 2.6 (cosh) x+ 5.1 (sinh) x= 8.73 and leave the answer to 4 decimal places.

(7 marks)

Question 4

With reference to Calculations with Hyperbolic and Trigonometry Functions.

(a) Solve the equation $8\,sin^2\,\theta + 2\sin\,\theta - 1 = 0$ for all values of $0° \leq \theta \leq 360°$.

(5 marks)

(b) i. Proof the following trigonometry equation: $\frac{\sin 4\theta + \sin 2\theta}{\cos 4\theta + \cos 2\theta} = \tan 3\theta$ by using sum to products.

(5 marks)

ii. Verify the $\sinh(2x) = 2\sinh(x)\cosh(x)$ by using Hyperbolic Identity.

(6 marks)

iii. Verify the $\tan^2 x + 1 = \sec^2 x$ by using Pythagorean Identity.

(4 marks)

Question 5

With reference to Calculations with Binomial, Arithmetic and Geometric Series.

(a) Differentiate between sequence and series.

(2 marks)

(b) The seventh term of geometric is 32 and the last term is 512. If the first term is 0.5, determine:

i. the number of terms.

(6 marks)

ii. the sum of the progression.

(3 marks)

iii. the 15th term.

(3 marks)

(c) Use the binomial series to determine the expansion of $(0.97)^6$.

(6 marks)

Question 6

With reference to Calculations with Linear Equation, Polynomial and Arithmetic Series.

(a) $x + y = 2$

$2x + 3y = 4$

Solve x and y by using substitution method.

(7 marks)

(b) Given $f(x) = 6x^3 + 3x^2 + 5x - 12$ where A and B are constants.

If $f(x)$ is divided by $(x - 1)$.

(8 marks)

(c) An engineer earns *RM 21000.00* per annum and receives annual increments *of RM 600.00.* Determine the salary in the 9^{th} year and calculate the total earnings in the first 11 years.

(5 marks)

END OF EXAMINATION PAPER

ENGINEERING MATHEMATICS 1

QUADRATIC FORMULA

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

COMPLEX FORMULA

De Moivre's Theorem $Z^n = r^n(\cos nx + i\sin nx)$

VOLUME AND SURFACE AREA

Volume	Surface area
Prism $v = l \times b \times h$ $l = length,\ b = base,\ h = height$	**Prism** $Surface\ area = 2(bh + hl + lb)$
Cylinder $v = \pi r^2 h$ $r = radius,\ h = height$	**Cylinder** $Surface\ area = 2\pi rh$
Sphere $v = \frac{4}{3}\pi r^3$	**Sphere** $Surface\ area = 4\pi r^2$
Cone $v = \frac{1}{3}\pi r^2 h$ $r = radius,\ h = height,\ l = length,$	**Cone** $Surface\ area = \pi rl + \pi r^2$

HYPERBOLIC FUNCTION

$\cosh x = \frac{e^x + e^{-x}}{2}$	$\sinh x = \frac{e^x - e^{-x}}{2}$	$\tanh x = \frac{e^x - e^{-x}}{e^x + e^{-x}}$

HYPERBOLIC IDENTITIES

$$cosh^2(x) - sinh^2(x) = 1$$

ADDITION AND SUBTRACTION FORMULAS

$$\sinh(A \pm B) = \sinh A \cosh B \pm \cosh A \sinh B$$
$$\cosh(A \pm B) = \cosh A \cosh B \pm \sinh A \sinh B$$

DOUBLE-ANGLE FORMULAS

$$\sinh(2x) = 2\sinh(x)\cosh(x)$$
$$\cosh(2x) = cosh^2(x) + sinh^2(x)$$
$$sinh^2(x) = \frac{\cosh 2x - 1}{2}$$
$$cosh^2(x) = \frac{\cosh 2x + 1}{2}$$

Pythagorean Identities		
$\sin^2\theta + \cos^2\theta = 1$	$1 + \cot^2\theta = \csc^2\theta$	$1 + \tan^2\theta = \sec^2\theta$

TRIGONOMETRIC FUNCTION

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
$\sin\frac{\theta}{2} = \pm\sqrt{\frac{1-\cos\theta}{2}}$	$\sin 2\theta = 2\sin\theta\cos\theta$
$\cos\frac{\theta}{2} = \pm\sqrt{\frac{1+\cos\theta}{2}}$	$\cos 2\theta = \cos^2\theta - \sin^2\theta$ .... $= 1-2\sin^2\theta$ .... $= 2\cos^2\theta - 1$
$\tan\frac{\theta}{2} = \frac{1-\cos\theta}{\sin\theta} = \frac{\sin\theta}{1+\cos\theta}$	$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

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

EXPONENTIAL FUNCTION

STANDARD FORM	GENERAL FORM
$\frac{d}{dx}e^{x}=e^{x}$	$\frac{d}{dx}e^{f(x)}=f'(x)e^{f(x)}$

LOGARITHMIC FUNCTION

STANDARD FORM	GENERAL FORM
$\frac{d}{dx}\ln x=\frac{1}{x}$	$\frac{d}{dx}\ln f(x)=\frac{f'(x)}{f(x)}$