

UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION
JANUARY 2016 SEMESTER

COURSE CODE : LMD10503
COURSE NAME : TECHNICAL MATHEMATICS 1
PROGRAMME NAME : DIPLOMA OF ENGINEERING TECHNOLOGY IN
(FOR MPU: PROGRAMME LEVEL) MARINE ENGINEERING
DATE : 18 MAY 2016
TIME : 09.00 AM – 11.30 AM
DURATION : 2 HOURS 30 MINUTES

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 only.
5. Please write your answers on the answer booklet provided.
6. Answer all questions in English language **ONLY**.

THERE ARE 8 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 15 marks)**INSTRUCTION: Answer ALL questions.****Please use the objective answer sheet provided.**

1. If $27 = 3^x$, determine the value of x
 - A. 3
 - B. 0
 - C. 2
 - D. 1

2. Given $2 \ln 2 + \ln x = \ln 6$, determine the value of x .
 - A. 1.50
 - B. 0.41
 - C. 1.79
 - D. 1.10

3. Express $2 \log_3 2x^2 - \log_3 x$, as a single logarithm.
 - A. $\log_3 4x$
 - B. $\log_3 2x^3$
 - C. $\log_3 2x^2$
 - D. $\log_3 4x^3$

4. If $-4g + 3(16 - 20g) = -16$, determine the value of g .
 - A. 1
 - B. -1
 - C. 3
 - D. -2

5. If $a(3+b) = b + c^2b - 3$, express b in term of a and c .

A. $b = \frac{-3-3a}{a-1-c^2}$

B. $b = \frac{-6}{a-1-c^2}$

C. $b = \frac{-3-3a}{a-c^2}$

D. $b = \frac{3a-3}{a+1+c^2}$

6. Solve the linear equation $\frac{6(a+1)}{12} = 3a - 2$.

A. 5

B. 12

C. 3

D. 1

7. Determine the factors of $2x^2+5x-3=0$.

A. $(2x+1)(x+3)$

B. $(2x-1)(x+3)$

C. $(2x+1)(x-3)$

D. $(2x-1)(x-3)$

8. Solve $x^2-1=0$

A. 1

B. 0 and 1

C. 1 and -1

D. -1

9. If $Q(x) = x^3+5x^2-2x-24$. Evaluate $Q(-2)$

A. 0

B. 1

C. -8

D. 8

10. $\begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix} - \begin{bmatrix} -2 & 7 \\ 3 & 2 \end{bmatrix} =$

A. $\begin{bmatrix} 5 & 6 \\ 2 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 5 & -6 \\ -2 & 0 \end{bmatrix}$

C. $\begin{bmatrix} -5 & 6 \\ -2 & 4 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 8 \\ 4 & 4 \end{bmatrix}$

11. Express 235° in radian.

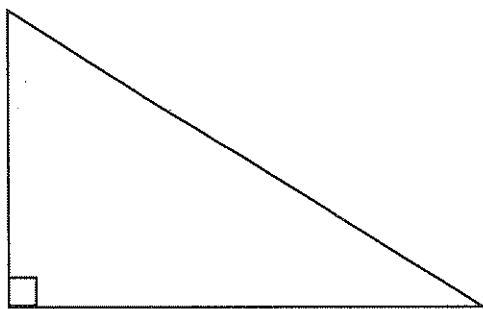
A. $\frac{\pi}{235}$

B. $\frac{235}{\pi}$

C. $\frac{47\pi}{36}$

D. $\frac{36\pi}{47}$

12. Identify the type of triangle in the following Figure 1.



- A. Isosceles triangle.
- B. Equilateral triangle
- C. Right triangle.
- D. Obtuse triangle.

13. Determine i^{35} .
- A. $-i$
 - B. i
 - C. -1
 - D. 1
14. Determine the complex conjugate of $q=2-3i$.
- A. $3i$
 - B. $-2+3i$
 - C. $2+3i$
 - D. 3
15. If $A=5-4i$ and $B=2+3i$, determine $A+B$.
- A. $7-i$
 - B. $1-7i$
 - C. $7-7i$
 - D. $7-2i$

SECTION B (Total: 45 marks)

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

Question 1

Solve $2^{x+1}4^{3-x}=16(8^x)$

(5 marks)

Question 2

Given $\frac{1}{2}p+3=\frac{3p}{5}-1$, solve for p

(5 marks)

Question 3

Solve $\frac{x^2}{2}=5x-17$ by using quadratic formula.

(5 marks)

Question 4

When the expression x^3+2x^2+ax-7 is divided by $x+3$, the remainder is -4 . By using synthetic division, find the value of a .

(5 marks)

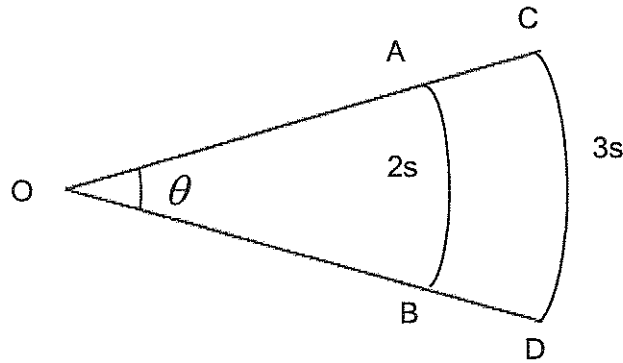
Question 5

Given $Q=\begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$ and $R=\begin{bmatrix} 1 & 1 \\ 2 & 5 \end{bmatrix}$, show that $(QR)^T=R^TQ^T$.

(5 marks)

Question 6

Figure below shows the length of the arc of two circle, AB and CD subtended by a central angle is $2s$ and $3s$ respectively. Given that the angle θ is 1.5 radian and the area of ACDB is 135 cm^2 .



- (a) Determine the value of s (6 marks)
- (b) Find the length of arc AB and CD (2 marks)
- (c) Find the perimeter of ABCD (2 marks)

Question 7

Given $Z_1 = -3 + 4i$ and $Z_2 = 1 + 2i$

- (a) Draw the Argand diagram of Z_1 and Z_2 (2 marks)
- (b) Determine
 - i $Z_1 Z_2$
 - ii $\frac{Z_2}{Z_1}$(8 marks)

SECTION C (Total: 40 marks)**INSTRUCTION: Answer only TWO(2) question ONLY.****Please use the answer booklet provided.****Question 1**

Given the system of equations:

$$x_1 - x_2 + x_3 = 3$$

$$2x_2 - x_3 = 1$$

$$2x_1 + 3x_2 = 4$$

- (a) Write the system into matrix form.

(2 marks)

- (b) Solve the system by using Cramer's rule.

(18 marks)

Question 2

- (a) Solve the following simultaneous equations:

$$2x + y = 6$$

$$xy + y^2 - 8 = 0$$

(10 marks)

- (b) Given that
- $(x+3)$
- is a factor of
- $f(x)$
- , where
- $f(x) = px^3 + 4x^2 + qx - 60$
- , and when
- $f(x)$
- is divided by
- $(x-2)$
- , its remainder is
- -70
- . Determine the values of
- p
- and
- q
- .

(10 marks)

Question 3

Given that $A = -3 + 5i$, $B = -10 - 8i$, $C = 8(\cos 75^\circ + i \sin 75^\circ)$ & $D = 4(\cos 100^\circ + i \sin 100^\circ)$

- (a) Sketch A and B on the Argand diagram (2 marks)
- (b) Determine the modulus and argument for A (8 marks)
- (c) Express A in trigonometry and exponential form (3 marks)
- (d) Determine $\frac{A}{CD}$ and leave your answer in trigonometry form (7 marks)

END OF EXAMINATION PAPER

FORMULA SHEET

ALGEBRA

QUADRATIC FORMULA

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

TRIGONOMETRY 1

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

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
$Z = re^{i\theta}$

