



UNIVERSITI KUALA LUMPUR

**FINAL EXAMINATION
JANUARY 2014 SEMESTER**

SUBJECT CODE : WQD10103
SUBJECT TITLE : TECHNICAL MATHEMATICS 1
LEVEL : DIPLOMA
TIME / DURATION : 9.00 am – 11.30 am
(2 ½ HOURS)
DATE : 26 MAY 2014

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper **CAREFULLY**.
 2. This question paper is printed on both sides of the paper.
 3. Please write your answers on the answer booklet provided.
 4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
 5. This question paper consists of **THREE (3)** parts. Part A, B and C. Answer all questions in Part A and B. For Part C, answer two (2) questions only.
 6. Answer all questions in English.
 7. Formula Sheet is appended.
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THERE ARE 9 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

PART A (Total: 15 marks)**MULTIPLE CHOICE QUESTIONS****INSTRUCTION: Answer ALL questions.****Please use the answer booklet provided.**

1. Determine the value of 2^{-3} .
 - A. -6
 - B. -8
 - C. $\frac{1}{6}$
 - D. $\frac{1}{8}$

2. Determine the value of $\log_7 5$.
 - A. 0.6990
 - B. 0.8271
 - C. 0.8451
 - D. 1.2091

3. Express $\left(\frac{-2}{n^3}\right)^3$ in its simplest form.
 - A. $\frac{8}{n^9}$
 - B. $\frac{8}{n^6}$
 - C. $\frac{-8}{n^9}$
 - D. $\frac{-8}{n^6}$

4. If $ax + b = -5x - 8$, determine the value of b .
- A. -8
 - B. 8
 - C. $\frac{8}{5}$
 - D. $\frac{5}{8}$
5. If $-4m + 8 = 4m$, determine the value of m .
- A. -2
 - B. 2
 - C. 1
 - D. -1
6. If $\frac{3}{5}k = 10$, then k is equal to
- A. $\frac{50}{3}$
 - B. $\frac{30}{5}$
 - C. 47
 - D. 35
7. Determine the vertex of $f(x) = (x + 1)^2 - 3$.
- A. $(1, 3)$
 - B. $(-1, 3)$
 - C. $(1, -3)$
 - D. $(-1, -3)$
8. Solve $p^2 - 169 = 0$.
- A. 13
 - B. 13 and -13
 - C. 0 and 13
 - D. -13

9. If $\begin{bmatrix} a^2 & -5 \\ 1 & b \end{bmatrix} = \begin{bmatrix} 9 & -5 \\ 1 & 3 \end{bmatrix}$ determine the value of a .
- A. 3 and -3
 - B. 9 and -9
 - C. 3
 - D. 9
10. Let $f(x) = -x^3 - 5$ and $g(x) = 2x^2 - 3x$, determine $g(x) - f(x)$.
- A. $-x^3 + 2x^2 - 3x - 5$
 - B. $x^3 + 2x^2 - 3x + 5$
 - C. $-x^3 - 2x^2 - 3x - 5$
 - D. $-x^3 - 2x^2 + 3x - 5$
11. Determine i^9 .
- A. i
 - B. $-i$
 - C. -1
 - D. 1
12. Convert 39.3° to radians.
- A. 0.6859radian
 - B. 0.2183radian
 - C. 0.3430radian
 - D. 0.1092radian
13. Calculate the radius of a circle with an area of 535.35 cm^2 .
- A. $r = 170.41 \text{ cm}$
 - B. $r = 13.05 \text{ cm}$
 - C. $r = 85.20 \text{ cm}$
 - D. $r = 15.50 \text{ cm}$

14. If $A = -9 + 7i$, determine \bar{A} .
- A. $-9 + 7i$
 - B. $9 - 7i$
 - C. $9 + 7i$
 - D. $-9 - 7i$
15. Given $Z = \sqrt[3]{8}(\cos 115^\circ + i \sin 115^\circ)$, determine the modulus, r , of Z .
- A. -0.8452
 - B. 1.8126
 - C. 2
 - D. 2.8284

PART B (Total: 45 marks)**INSTRUCTION: Answer ALL questions.****Please use the answer booklet provided.****Question 1**Express $\log mn + 2\log\left(\frac{m}{n}\right) + 3\log\left(\frac{n}{m}\right)$ as a single logarithm.

[5 marks]

Question 2a) Given $3q + 2p = 3p + 7$, express q in terms of p .

[2 marks]

b) Solve $5(a - 3) + 7a - 3 = 2a + 5(a - 3)$

[3 marks]

Question 3Solve $3x(x + 4) = 3$ by using a quadratic formula.

[5 marks]

Question 4Given $M(x) = 3x^2 + 2x - 2$ and $N(x) = x^2 + 5x + 1$. If $F(x) = N(x)M(x)$ determinea) $F(x)$

[3 marks]

b) $F(-2)$

[2 marks]

Question 5

Given $V = \begin{bmatrix} -2 & 3 \\ 6 & -5 \end{bmatrix}$, $W = \begin{bmatrix} -3 & 2 \\ 0 & 3 \end{bmatrix}$ and $X = \begin{bmatrix} 4 & 2 \\ -1 & -1 \end{bmatrix}$. Determine:

a) $2V + X$.

[2 marks]

b) WV^T .

[3 marks]

Question 6

a) Calculate the length of the arc subtends the given central angle $\theta = 33^\circ$ on a circle with radius $r = 7.5$ cm.

[3 marks]

b) Given triangle ABC in Figure 1, determine angle A and B.

[7 marks]

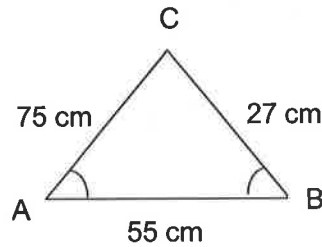


Figure 1

Question 7

Given $Z_1 = 6 - 7i$ and $Z_2 = -3 + 5i$. Determine :

a) $Z_1 Z_2$

[3 marks]

b) $\frac{\bar{Z}_1}{Z_2}$

[7 marks]

PART C (Total: 40 marks)

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

Question 1

- a) Solve the following simultaneous equations by using the elimination method.

$$11p + 6q = 79$$

$$3q = -11p + 67$$

[5 marks]

- b) Given that $(x - 4)$ is a factor of $f(x) = x^3 - 5x^2 - 2x + 24$. Factorize $f(x)$ completely.

[5 marks]

- c) Given the system of equations:

$$2x + 2y = 6$$

$$4x - 2y = 6$$

$$-2y + 4z = -8$$

- i. Write the system into matrix form.

[2 marks]

- ii. Determine the value of z by using Cramer's rule.

[8 marks]

Question 2

- a) Evaluate the shaded area of the metal sheet (Figure 2) with the circle piece removed.

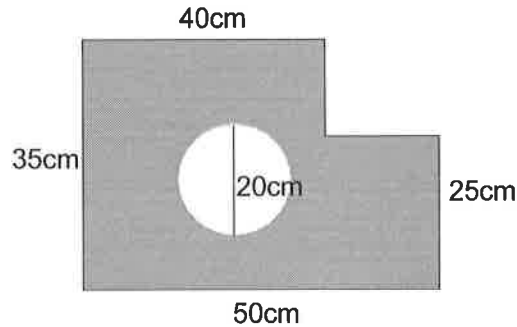


Figure 2

[10 marks]

- b) Meteorologists determine the height of a cloud using an instrument called a ceilometer. Figure 3 shows a ceilometer consists of a light projector that directs a vertical light beam up to the cloud base and a light detector 1 that scans the cloud to detect the light beam. On 28 February 2014, at Kuala Lumpur International Airport, a ceilometer with a base of 500 feet was employed. If the angle of elevation of the light detector 1 is 77° ,

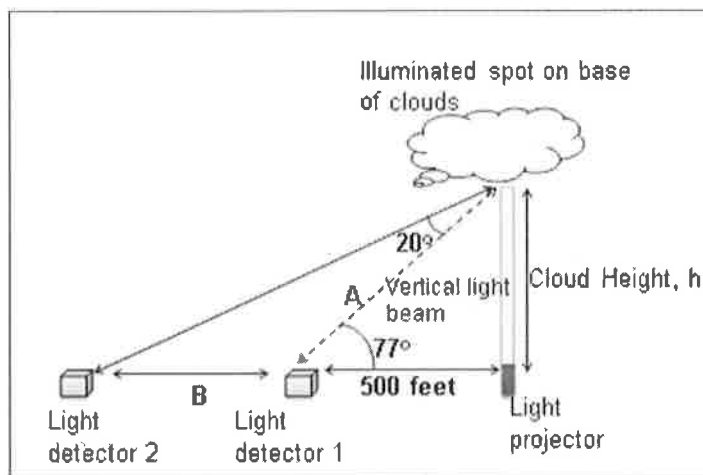


Figure 3

- i. Calculate the height of the cloud cover.

[3 marks]

- ii. Determine the distance A.

[3 marks]

- iii. Determine the distance B.

[4 marks]

Question 3

Given that $Z_1 = 3 + 2i$, $Z_2 = 9 - 3i$, and $W = Z_1 Z_2$.

a) Determine \overline{W} .

[4 marks]

b) Express \overline{W} in trigonometric, polar and exponential form.

[10 marks]

c) Determine $(\overline{W})^3$ in the form $a + ib$ by using De Moivre's Theorem.

[6 marks]

END OF QUESTION

FORMULA SHEET

ALGEBRA

QUADRATIC FORMULA

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

TRIGONOMETRY 1

Arc of length, $S = r\theta$ Area of sector, $A = \frac{1}{2}r^2\theta$

LAW OF SINE

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

LAW OF COSINE

$$a^2 = b^2 + c^2 - 2bc\cos A$$

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 : $Z = re^{i\theta}$

DE MOIVRE'S THEOREM

$$Z^n = r^n(\cos n\theta + i\sin n\theta)$$

$$Z^n = r^n \angle n\theta$$

$$Z^n = r^n e^{in\theta}$$