UNIVERSITI KUALA LUMPUR

FINAL EXAMINATION

JANUARY 2016 SEMESTER

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

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.

THERE ARE 10 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

PART A (Total: 15 marks)

MULTIPLE CHOICE QUESTIONS

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

1. If $-2w+2=w+11$, determine the value of w.

   A. -4

   B. -3

   C. 1

   D. $\frac{1}{2}$

2. If $\frac{2t}{3}=\frac{-3t+6}{-2}$, then t is equal to:

   A. $\frac{18}{5}$

   B. $-\frac{31}{5}$

   C. $\frac{1}{2}$

   D. 2

3. Given $3^{x-2}=81$. Solve for m

   A. 1

   B. 4

   C. 3

   D. 6

4. Determine the vertex of $2(x-8)^2-3$.

   A. $(8,-3)$

   B. $(-8,-3)$

   C. $(2,-3)$

   D. $(8, 3)$

5. Solve $\frac{w^2}{4} = 16$.

A. $w = 8$, $w = -8$

B. $w = 0$, $w = -16$

C. $w = 0$, $w = 4$

D. $w = 4$, $w = 16$

6. Given $\log_2 2t = 3$. Determine the value of t

A. 0

B. Undefined

C. 4

D. 5

7. Evaluate $\log_2 4 - \log_2 8$

A. $\frac{1}{2}$

B. 2

C. -4

D. -1

8. Perform the operation $\begin{bmatrix} 2 & 3 \end{bmatrix} \begin{bmatrix} 11 \\ -6 \end{bmatrix}$.

A. 30

B. 4

C. 3

D. 12

9. Let $f(x) = 3x^2 - 1$. Determine $2[f(x)]^2$

A. $4x^4 - 4x^2 + 1$

B. $18x^4 - 12x^2 + 2$

C. $4x^4 - 2x^2 + 4$

D. $8x^4 - 2x^2 - 2$

10. Evaluate the value of $-8^{\frac{2}{3}}64^{\frac{1}{2}}$

A. -32

B. 32

C. 16

D. 10

11. Given a parallelogram has an area of $40cm^2$ and a base of $10cm$, determine its height.

A. 4 cm

B. 8 cm

C. 2 cm

D. 16 cm

12. The value of $\tan 240^\circ$ is equivalent to:

A. $\cos 60^\circ$

B. $\sin 60^\circ$

C. $\tan 60^\circ$

D. $-\tan 60^\circ$

13. Simplify $3+\sqrt{-4}$ in standard form $a+bi$.

A. $3-2i$

B. $-10-16i$

C. $10-16i$

D. $3+2i$

14. Determine the modulus of the complex number $4-2i$.

A. $\sqrt{40}$

B. $\sqrt{86}$

C. $\sqrt{20}$

D. $\sqrt{34}$

15. Simplify $(3-5i)+(-4+7i)$.

A. $-2+3i$

B. $1+2i$

C. $-1+2i$

D. $7-2i$

PART B (Total: 45 marks)

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

Question 1

a) Simplify $p^{-2} \times p^{6} \div p^{-3}$

[2 marks]

b) Determine the value of $\sqrt{64} \times \sqrt{5^4} \div 8^{-\frac{1}{3}}$

[3 marks]

Question 2

Solve the following equations:

a) $\dfrac{x+3}{2} = -1$

[2 marks]

b) $\dfrac{x+3}{4} = \dfrac{2-3x}{3}$

[3 marks]

Question 3

The three sides of a right-angled triangle are x, $x+1$ and 5. Determine the value of x, if the longest side is 5.

[5 marks]

Question 4

Given $P(x) = -3x^2 - 2x$ and $Q(x) = 4x^2 + 4x + 3$, determine

a) $3P(2)$

[2 marks]

b) $P(x)Q(x)$

[3 marks]

Question 5

Given $P = \begin{bmatrix} 3 & 4 \\ -5 & 10 \end{bmatrix}$ and $Q = \begin{bmatrix} 0 & -1 \\ 2 & 6 \end{bmatrix}$. Determine:

a) $P - Q$

[2 marks]

b) $(QP)^T$

[3 marks]

Question 6

a) Determine all the possible values of θ if $\tan\theta = -0.4663$ for $0^0 \leq \theta \leq 360^0$.

[4 marks]

b) Figure 1 shows a ladder leans against the side of a building with its foot 7.5 m away from building and makes an angle of 70^0 with the ground. Determine:

i. the length of the ladder, PQ

ii. the area of the triangle PQR

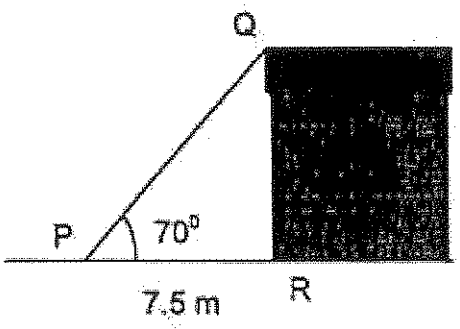

Figure 1

[6 marks]

Question 7

Given $Z = 5i$, $W = 1 - 2i$, and $R = 2 + i$. Determine:

a) $\overline{Z} - W$

[2 marks]

b) $\overline{WR}$

[4 marks]

c) $\frac{W}{Z}$

[4 marks]

PART C (Total: 40 marks)

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

Question 1

a) Sketch the graph of $y = -x^2 + 5x + 24$ and determine whether the vertex is a minimum or maximum point.

[10 marks]

b) Given $(x - k)$ is a factor of the expression $f(x) = 2x^2 + (k-3)x - k^2 + 5k - 2$. Determine the possible value(s) of k.

[5 marks]

c) Solve the following simultaneous equations by using the substitution method.

$$x + 3y = 5$$
$$3x + y = 12$$

[5 marks]

Question 2

a) From a point M, the angle of elevation to the top of a building B is 34°. From a point N, 20 m to the building B, the angle of elevation is 49°.

i. Draw a diagram of this situation.

[3 marks]

ii. Calculate the height of building B.

[3 marks]

iii. Calculate the distance between point M to point N.

[4 marks]

b)

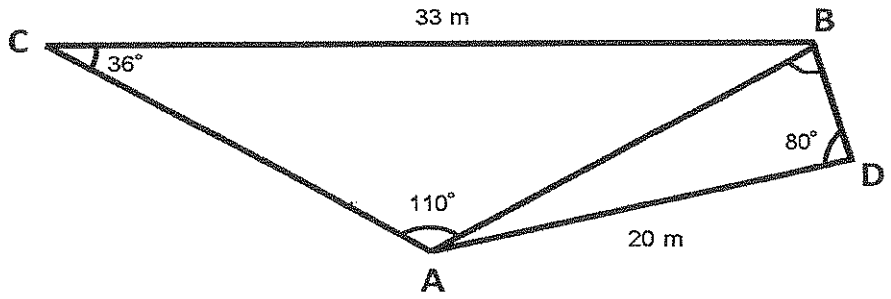

Figure 2

Given that the length CB is 33m and AD is 20m as shown in Figure 2. Meanwhile, $\angle CAB$ is $110°$, $\angle ACB$ is $36°$ and also $\angle ADB$ is $80°$. Calculate $\angle ABD$.

[10 marks]

Question 3

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

a) Determine:

i. $Z_1 + Z_2$

[2 marks]

ii. $Z_1 Z_2$

[4 marks]

iii. $W = \dfrac{Z_1 + Z_2}{Z_1 Z_2}$ in the form $a + bi$.

[6 marks]

b) Express W in trigonometric and polar form.

[8 marks]

END OF QUESTION

FORMULA SHEET

ALGEBRA

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

TRIGONOMETRY 1

Arc of length, $S = r\theta$	Area of sector, $A = \dfrac{1}{2} r^2 \theta$
LAW OF SINE	**LAW OF COSINE**
$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$	$a^2 = b^2 + c^2 - 2bcCosA$

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'S THEOREM
$Z^n = r^n(\cos n\theta + i\sin n\theta)$ $Z^n = r^n \angle n\theta$ $Z^n = r^n e^{in\theta}$