INTI International University & Colleges

FINAL
Examination Paper

(COVER PAGE)

Session	:	**AUGUST 2019**
Programme	:	Diploma in Information Technology (DITN) Diploma in Information and Communication Technology (DICTN)
Course	:	**MAT1103: Fundamentals of Mathematics**
Date of Examination	:	December 14, 2019 (Saturday)
Time	:	8:00am – 10:00am Reading Time : Nil
Duration	:	2 Hours

Special Instructions :

This question paper consists of **SIX (6)** questions. Answer any **FOUR (4)** questions in the answer booklet provided.

Materials permitted :
Non programmable calculator

Materials provided :
Formula Sheet

Examiner(s)	:	**Chong Mee Teng,** Mohd Hafis and Narinderjit
Moderator	:	Dr Ng Set Foong

This paper consists of 7 printed pages, including the cover page

DIPLOMA IN INFORMATION TECHNOLOGY PROGRAMME (DITN)
DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY (DICTN)
MAT1103: FUNDAMENTALS OF MATHEMATICS
FINAL EXAMINATION: AUGUST 2019 SESSION

Instructions: This paper consists of **SIX (6)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Let $f(x) = 3x^2 + 2$ and $g(x) = 2x - 1$. Find each of the following functional values:

(i) $f(-1)$ (2 marks)

(ii) $gf(x)$ (4 marks)

(b) Solve the following logarithmic equation: (5 marks)

$$\log_7(x) + \log_7(x+10) = 1$$

(c) Find the following integral: (5 marks)

$$\int_1^2 \frac{6x^4-1}{x^2}\, dx$$

(d) Solve the following inequalities. Build a table to test number for each interval. (9 marks)

$$x^2 + x - 12 > 0$$

(Total: 25 marks)

Question 2

(a) Let $f(x)=3x-4$ and $g(x)=x^2+1$.

(i) Find $g^{-1}(x)$ and $f^{-1}(x)$. Then find the $(g^{-1}f^{-1})(x)$. (5 marks)

(ii) Find $\left(\frac{f}{g}\right)(2)$. (4 marks)

(b) Find the equation of the line passing through (7, -2) and parallel to the line segment joining (1, 2) and (2, -5). (5 marks)

(c) Assume that $\log 2 = a$ and $\log 3 = b$, express the following in terms of a and b:

(i) $\log 5$ (2 marks)

(ii) $\log\sqrt{18}$ (3 marks)

(d) Solve the radical equation and verify the answers in case of extraneous solutions.

$$\sqrt{x+7}=\sqrt{2x}+1$$ (6 marks)

(Total: 25 marks)

Question 3

(a) Solve the following equations for x. Express your answer up to 3 significant figures where applicable.

(i) $x^4 - 9 = 0$ (3 marks)

(ii) $e^{1-3x} = 3$ (3 marks)

(b) The eighth term of an arithmetic progression is half its second term. The eleventh term exceeds one-third of its fourth by 1. Find the 15^{th} term. (6 marks)

(c) Find the following integrals: (4 marks)

$$\int_0^1 \sqrt{x}(1 - x^2)dx$$

(d) Sketch the graphical solution of the following system of inequalities. (9 marks)

$$y \leq \frac{2}{3}x + 3$$
$$y > -\frac{4}{3}x - 3$$
$$x \leq 2$$
$$y > -2$$

(Total: 25 marks)

Question 4

(a) Simplify the expression below to the simplest form and rewrite using only positive exponents.

(i) $3\sqrt{18} + \sqrt{50} - \sqrt{98}$ (3 marks)

(ii) $\dfrac{-3x^2y^3z^2}{18x^3y^4z^2}$ (5 marks)

(b) Find the value of x in each equation below:

(i) $4^{(x+3)} = \frac{1}{64}$ (3 marks)

(ii) $\ln(x^2 - 1) = 1 + \ln(x - 1)$ (correct to 4 decimal places) (5 marks)

(c) The sum to infinity of a geometric series is $\frac{3}{4}$ and the sum of the first two terms is $\frac{2}{3}$.

(i) Find the 1st term, a and the common ratio, r ($r < 0$). (6 marks)

(ii) Find the 10th term in the series. (3 marks)

(Total: 25 marks)

Question 5

(a) Solve the following inequalities.

(i) $-3 \leq 2x - 1 < 2$ (3 marks)

(ii) $3|x - 1| - 5 \geq 4$ (4 marks)

(b) Sketch the graph of the function $f(x) = 2x^2 - 4x - 1$ with the x-intercept, y-intercept and vertex shown clearly. (6 marks)

(c) Solve the following simultaneous equations by using substitution and/or addition method. (6 marks)

$$3x - y + z = -1$$
$$2x + 3y + z = 4$$
$$5x + 4y + 2z = 5$$

(d) Find $\frac{d^2y}{dx^2}$ of $y = \frac{1+x^2}{1+x}$. (6 marks)

(Total: 25 marks)

Question 6

(a) Given two points, P (0, 4) and Q (-2, 5).

(i) Find the distance between P and Q. (2 marks)

(ii) Find the slope and midpoint of the line PQ. (4 marks)

(b) Simplify the expression below to the simplest form and rewrite using only positive exponents.

(i) $\dfrac{2x-6}{x-5}-\dfrac{x-9}{5-x}$ (3 marks)

(ii) $\dfrac{2w-16}{w^2-5w-24}\div\dfrac{1+w}{w^2-9}$ (3 marks)

(c) Find the sixth term of the expansion of $(x+\frac{y}{4})^{10}$. (6 marks)

(d) Find the derivative of the following equation. (7 marks)

$$x^2+4y^2=5xy$$

(Total: 25 marks)

~The End~