



FINAL
Examination Paper

(COVER PAGE)

Session : August 2015

Programme : Diploma In Information And Communication Technology (DICTN)

Course : MAT1103: Fundamentals Of Mathematics

Date of Examination : December 9, 2015

Time : 2.00pm – 4.00pm Reading Time : Nil

Duration : 2 Hours

Special Instructions :

Answer any **FOUR (4)** structured-type questions.

Materials permitted : Non-Programmable Calculator

Materials provided : Nil

Examiner(s) : Mr. Aung Min and Mr. Bark Chee Beng

Moderator : Dr. Ng Set Foong

This paper consists of 5 printed pages, including the cover page

DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY (DICTN)
MAT1103: FUNDAMENTALS OF MATHEMATICS
FINAL EXAMINATION: AUGUST 2015 SESSION

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

Question 1

(a) Simplify the following expressions. Leave your answer without using negative exponents.

(i) $\left(\frac{2x^2y^5z^3}{3xy^7z^2}\right)^{-2}$ (3 marks)

(ii) $\frac{3x^3y^{-4}}{(3x^2y^{-3})^2}$ (3 marks)

(b) Factorize completely the following polynomial.

$$3x^2 + 3x - 36 \quad (3 \text{ marks})$$

(c) Rationalize the denominator of the following expressions.

(i) $\frac{1}{\sqrt{2}+\sqrt{5}}$ (3 marks)

(ii) $\frac{\sqrt{2x+3}}{2\sqrt{2x}}$ (3 marks)

(d) Simplify the expressions completely. Assume that all variables represent positive variables.

(i) $\frac{3x^2+7x+2}{x^2+2x} \times \frac{x^2-x}{3x^2+x}$ (5 marks)

(ii) $\frac{x^2-4x+4}{x+2} \div \frac{x-2}{x^2+5x+6}$ (5 marks)

Question 2

(a) Solve the following equations for x .

(i) $|2x - 3| + 3 = 12$ (4 marks)

(ii) $\sqrt{\frac{8x+43}{3}} - 1 = x$ (5 marks)

(b) Solve the following inequalities.

(i) $7 \leq 4x - 1 < 15$ (3 marks)

(ii) $\left| \frac{2x-4}{5} \right| > 6$ (4 marks)

(iii) $-4 + |2(x - 2) + 3| \leq 3$ (5 marks)

(c) A piece of 42 cm long copper wire is bent into the shape of a rectangle whose length is twice its width. Find the dimensions of the rectangle. (4 marks)

Question 3

(a) Given a function $f(x) = -x^2 - 4x + 5$.

(i) State the x-intercept and y-intercept of the function. (3 marks)

(ii) State the minimum/ maximum value of the function. (3 marks)

(iii) Sketch the graph and clearly show the axis of symmetry. (4 marks)

(b) A line passes through the points (7,5) and (3,2).

(i) Find the equation of that line. (4 marks)

(ii) Calculate the distance between these two points. (2 marks)

(iii) Find the midpoint between these two points. (2 marks)

- (c) Given $f(x) = x^4 + x^3 - 3x^2 - 4x - 1$.
- (i) By using the Factor Theorem, determine whether $(x + 1)$ is a factor of $f(x)$. (3 marks)
- (ii) Divide $f(x)$ by $(x + 1)$ to determine the quotient and the remainder. (4 marks)

Question 4

- (a) Solve the following equations. Give the answer up to 4 significant figures where necessary.
- (i) $8^{4x-1} = 5$ (4 marks)
- (ii) $2e^{2-3x} = 78$ (4 marks)
- (iii) $\log_3(x + 2) = \log_3 7 + \log_3 x$ (4 marks)
- (b) Use the laws of logarithms to express the following expressions into a single logarithm and then evaluate its value without using calculator.
- (i) $\log_{10} 25 + \log_{10} 4$ (3 marks)
- (ii) $\log_2 80 - \log_2 5$ (3 marks)
- (c) Given that $\log_5 a = 3$ and $\log_5 b = 4$. Find the following:
- (i) ab (3 marks)
- (ii) $2 \log_5 \left(\frac{a}{b^3} \right)$ (4 marks)

Question 5

- (a) Let $f(x) = 3x^2 - 5$ and $g(x) = \frac{3x}{x-1}$.

Find the followings:

- (i) $(f + g)(2)$ (3 marks)
- (ii) $(f \cdot g)(2)$ (2 marks)
- (iii) $(f \circ g)(2)$ (3 marks)
- (iv) $g^{-1}(x)$ (4 marks)

- (b) Find the simultaneous solution of the following system.

$$\begin{aligned}x + 2y + z &= 8 \\2x + y - z &= 1 \\x + y - 2z &= -3\end{aligned}\quad (6 \text{ marks})$$

- (c) Sketch the graphical solution of the following system of inequalities:

$$\begin{aligned}x &\leq 4 \\y &\leq x \\3x + 5y &\geq 15\end{aligned}\quad (7 \text{ marks})$$

Question 6

- (a) Find the 7th term in the binomial expansion of $(2x - 3y)^{12}$. (3 marks)
- (b) Expand $(2x^2 - 3y)^4$ in descending powers of x . (6 marks)
- (c) Given a geometric series $1 - \frac{1}{4} + \frac{1}{16} - \dots$. Find:
- the common ratio, r (2 marks)
 - the n^{th} term of the series (express in power of n) (2 marks)
 - the sum of terms from the 7th term to 15th term (leave your answer in exponent form) (4 marks)
- (d) In an arithmetic progression, the sum of the first ten terms is 520 and the 7th term is twice the 3rd term. Find:
- the first term, a , and the common difference, d (5 marks)
 - the sum of terms from the 7th term to 30th term. (3 marks)

