

FINAL
Examination Paper

(COVER PAGE)

Session : January / February 2016

Programme : Diploma In Information And Communication Technology (DICTN)

Course : MAT1103: Fundamentals Of Mathematics

Date of Examination : March 15, 2016 (Tuesday)

Time : 11.00am – 1.00pm 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 Ms. Fang Yen Yen

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: JANUARY / FEBRUARY 2016 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) $\left(\frac{r^{-3}}{q^{-5}r}\right)^0 \left(\frac{p^{-1}q^{-1}r^{-3}}{p^{-7}q^{-5}r}\right)^{-2}$ (3 marks)

(ii) $\frac{(x^2y^{-3})^{-2}}{(2x^3y^{-4})^{-1}}$ (3 marks)

(b) Factorize completely the following polynomial.

$2x^2 - 18$ (3 marks)

(c) Rationalize the denominator of the following expressions.

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

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

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

(i) $\frac{x^2-2x-3}{x^2-4} \div \frac{x^2+2x-15}{x^2+3x-10}$ (6 marks)

(ii) $\frac{x^2z-4xyz+4y^2z}{3xyz-6y^2z}$ (4 marks)

Question 2(a) Solve the following equations for x .

(i) $2x = 1 - \sqrt{2 - x}$ (4 marks)

(ii) $2|3x + 8| + 1 = 9$ (5 marks)

(b) Solve the following inequalities.

(i) $-4 < 5 - 3x < 17$ (3 marks)

(ii) $3 + \left| \frac{x-1}{2} \right| \leq 10$ (4 marks)

(iii) $3 \left| \frac{3x-1}{2} \right| > 15$ (5 marks)

(c) The lengths of the sides of a triangle are y^2 , $y + 1$, and 7 meters. If the perimeter is 20 meters, what is the value of y ? (4 marks)**Question 3**(a) A line passes through the points $(-4, 1)$ and $(-2, 3)$.

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

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

(iii) Find the slope of that line. (2 marks)

(b) Find the equation of the line that passes through the point $(1, -2)$ and perpendicular to the line $3y = 2x + 6$. (5 marks)(c) Given a polynomial $p(x) = 2x^3 + 5x^2 - x - 1$.(i) Show that $(2x - 1)$ a factor of $P(x)$. (2 marks)(ii) Find the results if $P(x)$ is divided by $(x + 1)$. (5 marks)

(d) Find the simultaneous solution of the following system.

$$2x - y - 2z = -3$$

$$x + 3y + z = -1$$

$$5x - 4y + 3z = 10$$

(7 marks)

Question 4

- (a) Given $f(x) = -2x^2 + 12x + 15$.
- (i) Find the y-intercept and x-intercepts. (3 marks)
- (i) Find the vertex point. (2 marks)
- (ii) Sketch the graph $f(x)$. (3 marks)

- (b) Let $f(x) = (x + 2)^2$ and $g(x) = \frac{2x+1}{x-4}$.

Find the followings:

- (i) $(f + g)(5)$ (3 marks)
- (ii) $(f \circ g)(5)$ (3 marks)
- (iii) $g^{-1}(x)$ (4 marks)

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

$$\begin{aligned} x - 2y &\geq 4 \\ 2x + 2y &\geq 14 \\ x &\geq 0 \\ y &\geq 0 \end{aligned} \quad (7 \text{ marks})$$

Question 5

- (a) Solve the following equations. Give the answer up to 4 significant figures where necessary.
- (i) $e^{1+3x} = 39$ (2 marks)
- (ii) $4^{2x+1} = 5^{1-3x}$ (4 marks)
- (iii) $4 \log(1 - 5x) = 2$ (4 marks)
- (iv) $\log_8(x + 2) - \log_8 3 = 2 \log_8(x + 2)$ (5 marks)
- (v) $\log_4(x + 3) + \log_4(2 - x) = 1$ (5 marks)
- (b) Find the exact value of x if $\log_x 5^3 = 3$. (2 marks)
- (c) If $p = \log 5$, express $\log 125$ in terms of p . (3 marks)

Question 6

- (a) Find the 3rd term in the binomial expansion of $(x^2 + \frac{1}{x})^9$. (4 marks)
- (b) Expand $(x - 2y)^4$ in descending powers of x . (5 marks)
- (c) Given the arithmetic sequence, $-3, -8, -13, \dots, -163$. Find:
- (i) The number of terms (4 marks)
 - (ii) The sum of all terms. (3 marks)
- (d) Given $k - 3, k + 1$ and $4k - 2$ are first 3 terms of a geometric sequence.
- (i) Find the possible values of k . (5 marks)
 - (ii) Find the first term and common ratio for each value of k (4 marks)

~THE END~

MAT1103(F) January 2016

