

FINAL
Examination Paper

(COVER PAGE)

Session : April 2016

Programme : Diploma In Information And Communication Technology (DICTN)

Course : **MAT1103: Fundamentals of Mathematics**

Date of Examination : 27 July, 2016 (Wednesday)

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) : **S.M. Elizabethrani Allappan, Teow Hsien Loong and 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: APRIL 2016 SESSION

Instruction: 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) Simplify the expressions below to the simplest form and rewrite using only positive exponents.

(i) $\frac{7ab^4}{28a^3b}$ (3 marks)

(ii) $\sqrt{20} + \sqrt{50} - \sqrt{18}$ (3 marks)

(iii) $\left(\frac{x^{-2}y^3z^5}{x^{-4}y^{-3}z^2}\right)^{\frac{1}{3}}^{-\frac{1}{8}}$ (5 marks)

(iv) $\frac{\sqrt{5}}{\sqrt{6}-2}$ (4 marks)

(v) $\frac{16x-3}{4x} \div \frac{6-x^2}{6x^2}$ (3 marks)

(b) Find the equation of the line that passes through the point (1,1) and is parallel to the line $y = 3x + 2$. (4 marks)

(c) Solve: $-3(x - 5) = -8(2x + 2) + 4x$ (3 marks)

Question 2

(a) Solve the inequalities:

(i) $-3 < 1 - 2x \leq 11$ (3 marks)

(ii) $|x - 3| = 0$ (2 marks)

(iii) $|5x + 4| < 8$ (4 marks)

- (b) Given a polynomial $p(x) = x^3 - 8x^2 + 17x - 10$.
- (i) Show that $(x - 5)$ is a factor of $P(x)$. (2 marks)
- (ii) Find the results if $P(x)$ is divided by $(x + 5)$. (5 marks)
- (c) Find the gradient, x and y intercepts for the equation, $x = -\frac{4}{5}y + 2$ (4 marks)
- (d) Find the 7th term in the expansion for $\left(x^3 + \frac{1}{2x}\right)^8$ (3 marks)
- (e) Solve $(x + 1)(x + 3) = 0$. (2 marks)

Question 3

- (a) Solve each equation. Check for extraneous solutions.
- (i) $\frac{1}{x-1} + \frac{3}{x+1} = 2$ (5 marks)
- (ii) $\sqrt{x^2 - 4} = \sqrt{2x - 1}$ (5 marks)
- (b) Let $f(x) = 3 + x$ and $g(x) = x - 5$. Find
- (i) $(f + g)(x)$ (1 mark)
- (ii) $(f \cdot g)(x)$ (2 marks)
- (iii) $gf(2)$ (3 marks)
- (c) The sum of 3 consecutive integers is 162. What are the integers? (3 marks)
- (d) Solve the system equations.
- $$\begin{aligned} 7x + 5y - 3z &= 16 \\ 3x - 5y + 2z &= -8 \\ 5x + 3y - 7z &= 0 \end{aligned}$$
- (6 marks)

Question 4

(a) Solve the following inequalities:

(i) $-5x - 2 > -3(x + 2) + 17.$ (3 marks)

(ii) $2x^2 + 9x > 5.$ (3 marks)

(iii) $-2 \leq \frac{3(x+7)}{5} \leq 6.$ (3 marks)

(iv) $2|5x - 4| \leq 8.$ (3 marks)

(b) Solve the following equations. Give your answers up to 3 decimal places where necessary.

(i) $9e^{5x} = 1269$ (2 marks)

(ii) $3 + 4 \ln x = 14$ (2 marks)

(c) Solve the following system simultaneously

$$\frac{4}{x} + \frac{3}{y} = 2$$

$$4y + 3x + 3 = 0$$

(5 marks)

(d) If the area of a square is greater than its perimeter by 45 cm, find the length of the square.

(4 marks)

Question 5(a) Solve the following equations for x :

(i) $10^{3(x-1)} - \frac{1}{100^{5x-3}} = 0,$ (3 marks)

(ii) $\frac{\sqrt{3x-7}}{\sqrt{2+x}} - 2 = 0.$ (3 marks)

(b) Rationalize the denominator of $\frac{5\sqrt{2}}{1-2\sqrt{2}}$ and simplify it. (3 marks)(c) Given that $f(x) = (3x - 2)(x + 6).$ (i) Find the vertex for $f(x)$ and state whether the vertex is a minimum or maximum point. (3 marks)(ii) Sketch the graph of $f(x)$ by indicating the vertex, x - and y -intercepts. (5 marks)

- (d) Find the equation of the line passing through the points (4,5) and (-2,2).
Sketch the graph. (4 marks)
- (e) Solve the following equation. Give the final answer corrected to 3 decimal places.
 $3^{x+1} = 8$. (4 marks)

Question 6

- (a) Given the first 5 terms of an arithmetic progression:
-15, x , y , z , 9
Find the values of x , y and z . (5 marks)
- (b) How many terms are there in the arithmetic progression of
200, 187, 174, ..., -8 (3 marks)
- (c) Solve $3x^2 - 5x = 6$.
(Hint: use quadratic formula.) (3 marks)
- (d) The n th term of geometric series is given by $\frac{3(2^n)}{8}$, find
- (i) first term, (1 mark)
 - (ii) common ratio, (2 marks)
 - (iii) T_6 , (2 marks)
 - (iv) S_6 . (3 marks)
- (e) The sum of the first 20 terms of an arithmetic series is 45. The sum of the first 40 terms of the series is 290. Find the first term and the common difference of the series. Hence, find the 6th term of the series. (6 marks)

