



FINAL
Examination Paper

(COVER PAGE)

Session : AUGUST 2017

Programme : Diploma in Information and Communication Technology (DICTN)

Course : MAT1103: Fundamentals of Mathematics

Date of Examination : 8 December, 2017 (Friday)

Time : 11:00 am – 1:00 pm 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. All questions carry equal marks.

Materials permitted : Non programmable calculator

Materials provided : Formula Sheet

Examiner(s) : Chan Ah Wah and Mohd Hafis Bin Zakaria

Moderator : Dr Ng Set Foong

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

DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY
PROGRAMME (DICTN)
MAT1103: FUNDAMENTALS OF MATHEMATICS
FINAL EXAMINATION: AUGUST 2017 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 following:

(i) $\sqrt{2}(6\sqrt{3} + 2\sqrt{2})$ (3 marks)

(ii) $\sqrt{18} + 2\sqrt{50}$ (3 marks)

(b) Rationalize the denominator $\frac{2+\sqrt{3}}{\sqrt{5}+3}$ (4 marks)

(c) Simplify each of the following fraction:

(i) $\frac{-12x^2y^3z^2}{18x^3y^4z^2}$ (3 marks)

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

(iii) $\frac{(x-1)^2}{4} \div \frac{x^2-1}{6}$ (4 marks)

(d) Perform the indicated operation and write your answer using only positive exponents.

$$\left(x^{\frac{2}{3}} + 1\right)(x^{-1} + x) \quad (4 \text{ marks})$$

Question 2

(a) Solve the following equations:

(i) $\frac{1}{x-1} + \frac{3}{x+1} = 2$ (5 marks)

(ii) $\frac{2}{x^2-9} = \frac{5}{x^2-3x}$ (4 marks)

(iii) $\sqrt{x+2} = 4-x$ (4 marks)

(b) Solve the following inequalities:

(i) $\frac{2x-3}{x+3} < 0$ (3 marks)

(ii) $x^2 + x - 6 > 0$ (5 marks)

(iii) $\frac{1}{|x+1|} > 5$ (4 marks)

Question 3

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

(b) Find the gradient and the y-intercept of the line $3(y + 2) = 6x - 1$. (3 marks)

(c) Let $f(x) = 5x - 2$ and $g(x) = 4x^2 + 2$. Find the following:

(i) $(f + g)(3)$ (2 marks)

(ii) $(f \cdot g)(3)$ (2 marks)

(iii) $(f \circ g)(3)$ (2 marks)

(iv) $g^{-1}(x)$ (3 marks)

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

(i) Find its y-intercept and x-intercept. (3 marks)

(ii) Find its vertex and axis of symmetry. (2 marks)

(iii) Sketch its graph. (4 marks)

Question 4

(a) Evaluate each of the following:

(i) $\log_{10} \frac{4}{35} + \log_{10} 70 - \log_{10} 2 + 2 \log_{10} 5$ (3 marks)

(ii) $4 \log_3 5 \times 2 \log_5 3$ (2 marks)

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

(i) $\log_{2x-1} 64 = 2$ (4 marks)

(ii) $7^{5-3x} = 3^{x+2}$ (with answer correct to 4 decimal places) (6 marks)

(c) Sketch the graph of $y = -e^{x+2}$.

(4 marks)

(d) A radioactive isotope decays exponentially. If 6 grams of the isotope decays to 3 grams in 5 years, how long will it take for the 6 grams to decay to 2 grams?

(6 marks)

Question 5

(a) Solve the following system of linear equations:

$$\begin{aligned} x + y + z &= 1 \\ 2x - y - z &= -4 \\ x - 2y + z &= 4 \end{aligned}$$

(6 marks)

(b) Sketch the graphical solution of the following system of inequalities:

$$\begin{aligned} 2x + y &< -1 \\ -3x + y &\leq 3 \\ y &\geq 4 \end{aligned}$$

(6 marks)

(c) Expand $(1 + 3x)^4$ in ascending powers of x.

(5 marks)

(d) Consider an arithmetic sequence whose 4th term is 10 and whose 10th term is 28.

(i) Find the first term and the common difference. (4 marks)

(ii) Find the sum of the first 20 terms. (4 marks)

Question 6

(a) Let $\{24, 12, 6, 3, \dots\}$ be a geometric sequence.

(i) Find the common ratio.

(2 marks)

(ii) Find the 20th term.

(3 marks)

(iii) Find the sum to infinity.

(3 marks)

(b) Find $\frac{dy}{dx}$ for the following functions and simplify the answers.

(i) $y = (x^2 + 3x + 1)^7$

(4 marks)

(ii) $y = (x - 1)(3x^2 - 2x + 1)$

(4 marks)

(c) Determine the following integrals:

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

(4 marks)

(ii) $\int \frac{x}{\sqrt{1-3x^2}} dx$

(5 marks)

~ The End ~

mat1103(f)/aug2017/formatted

Formula :

Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Arithmetic Progression:

$$T_n = a + (n-1)d$$

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

Geometric Progression:

$$T_n = a r^{n-1}$$

$$S_n = \frac{a(1-r^n)}{1-r} ; r < 1$$

$$SS_n = \frac{a(r^n - 1)}{r - 1} ; r > 1$$

Binomial Theorem:

$$(a+b)^n = {}^nC_0 a^n b^0 + {}^nC_1 a^{n-1} b^1 + \dots + {}^nC_n a^0 b^n$$