INTI INTERNATIONAL COLLEGE SUBANG

DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY PROGRAMME (DICTN)
MAT 1103: FUNDAMENTALS OF MATHEMATICS
FINAL EXAMINATION: JANUARY 2013 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) $\left(\frac{5x^{-3}y^{-2}}{3x^{2}y^{-3}}\right)^{-2}$ (3 marks)

(ii) $\left(\frac{3x^{5}y^{-3}}{6x^{-5}y^{3}}\right)^{2}$ (3 marks)

(b) Solve the following equations for x.

(i) $x + 4 = \sqrt{\frac{6x+6}{5}} + 3$ (5 marks)

(ii) $x - \sqrt{7x - 12} = 0$ (5 marks)

(iii) $\left|\frac{4x-2}{x}\right| = 3$ (5 marks)

(c) Simplify: $\frac{x^{2}+2x}{x-1} \times \frac{x^{2}-1}{x+2}$ (4 marks)

Question 2

(a) Find the distance and the midpoint between (-4,1) and (-1,0). (4 marks)

(b) Solve the following inequalities.

(i) $-5x + 3 \leq -2$ (2 marks)

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

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

(c) Determine whether $4x - 5y = 20$ and $5x - 4y = 40$ are parallel, perpendicular or neither. (5 marks)

(d) Find the equation of the line that passes through the point (-1, -2) and is perpendicular to the line $y = -4x + 3$. (5 marks)

Question 3

(a) Sketch the graph of the function $f(x) = 2(x + 3)^2 + 1$ by using the graph of $y = x^2$ and a combination of translation and stretching/shrinking. (8 marks)

(b) Let $f(x) = 7x - 4$ and $g(x) = x^2 + 1$.

Find the followings:

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

(ii) $(f.g)(2)$ (2 marks)

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

(iv) $g^{-1}(x)$ (4 marks)

(c) Find the remainder and the quotient when $x^4 - 20x^2 - 5x - 150$ is divided by $x + 5$ using long division. (6 marks)

Question 4

(a) By using the Factor Theorem, determine whether $(x + 1)$ is a factor of $f(x) = x^3 + 3x^2 - 4x - 12$. (4 marks)

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

$$x + y + 2z = 2$$
$$2x - y - z = -4$$
$$x - 2y + z = 4$$

(7 marks)

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

(i)
$$2x - y \leq 0$$
$$x + 2y \leq 10$$
$$y \geq 0$$

(7 marks)

(ii)
$$x + y \leq 5$$
$$x - 3y \leq -3$$
$$x \geq 0$$

(7 marks)

Question 5

(a) Find the third term of the expansion of $(2x - y)^5$ in descending powers of x. (4 marks)

(b) Expand $(x - 2y)^3$ in descending powers of x. (6 marks)

(c) If 5, 9 and 13 are the first three consecutive terms of an arithmetic sequence, determine the sum of the first 40 terms in this sequence. (5 marks)

(d) If 6 is the second term and -18 is the third term of a geometric sequence, determine the fifth term of this sequence. (5 marks)

(e) Evaluate:

$$\sum_{x=5}^{8} x^3 + \sum_{x=5}^{8} 3x^2$$

(5 marks)

Question 6

(a) Solve the following equations. Give the answer up to 4 significant figures where necessary.

(i) $6^{2x+1} = 5^{2-3x}$ (4 marks)

(ii) $e^{3x-1} = 4$ (3 marks)

(iii) $\log_8(x+2) - \log_8 3 = 2\log_8 (x+2)$ (4 marks)

(b) Factorize completely each of the following polynomials.

(i) $x^4 - y^4$ (4 marks)

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

(c) Rationalize the denominator of the following expressions.

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

(ii) $\frac{3x}{\sqrt{7}+2}$ (4 marks)

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