

INTI INTERNATIONAL UNIVERSITY

FOUNDATION IN BUSINESS INFORMATION TECHNOLOGY (CFPI)
MAT1215: FUNDAMENTALS OF MATHEMATICS
FINAL EXAMINATION: AUGUST 2015 SESSION

Instructions: This paper consists of **SIX (6)** questions. Answer any **FIVE (5)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Factorize the following polynomials completely .

(i) $(x+1)^2 - 25$. (2 marks)

(ii) $2t^3 - 250$. (2 marks)

(iii) $2y^3 - y^2 + 2y - 1$. (2 marks)

(b) Given that $\xi = \{x : 1 \leq x \leq 10, x \text{ is a integer}\}$,
 $P = \{1, 3, 5, 7, 9\}$,
 $Q = \{2, 3, 5, 7\}$ and
 $R = \{1, 2, 3, 4, 5\}$.

List the elements of the following sets.

(i) $(P \cap Q) \cup R$. (2 marks)

(ii) $\bar{Q} \cap (P \cup R)$. (2 marks)

(c) (i) If $\begin{bmatrix} 4 & b \\ \frac{1}{c} & -b \end{bmatrix} \begin{bmatrix} 7c \\ -3 \end{bmatrix} = \begin{bmatrix} 11b \\ 13 \end{bmatrix}$, find the values of b and c . (5 marks)

(ii) By using the method of inverse matrix, solve the following system of linear equations.

$$\begin{aligned} 2x - 5y &= -13 \\ -x + 7y &= 2. \end{aligned}$$

(5 marks)

Question 2

(a) Given that $f(x) = 2x^2 + x - 3$.

(i) Solve for the values of x when $f(x) = 0$.

(2 marks)

(ii) By using the method of completing the square, express $f(x)$ in the form $a(x+p)+q$ where a , p and q are constants.

(3 marks)

(iii) Hence, state the minimum value of $f(x)$ and the corresponding value of x .

(1 mark)

(iv) Sketch the graph of $f(x)$ showing the vertex, the x -intercepts and y -intercept clearly.

(3 marks)

(b) Evaluate the following definite integrals.

(i) $\int_3^6 (x-4)(x+6) dx$.

(2 marks)

(ii) $\int_0^2 (2x-3)^3 dx$.

(2 marks)

(iii) $\int_0^1 e^{(1-2x)} dx$.

(4 marks)

(iv) $\int_0^1 \frac{6x^2+1}{2x^3+x+1} dx$.

(3 marks)

Question 3

(a) Rationalize the denominator of $\frac{2\sqrt{7}+3\sqrt{5}}{3\sqrt{5}-2\sqrt{7}}$, giving your answer in the form

$\frac{a+b\sqrt{35}}{17}$ where a and b are integers.

(4 marks)

- (b) Eight letter codes are to be formed by using the following alphabets in the word.

$\{Q U E S T I O N\}$.

Find the number of ways the code can be formed, without repetition, if

- (i) there is no restriction, (2 marks)
- (ii) each code word ends with a vowel, (2 marks)
- (iii) each code word begins with a consonant, (2 marks)
- (iv) each code word has the vowels grouped together. (2 marks)
- (c) Given that the equation of a curve is $y = x^3 - 3x^2 + 2$. Find
- (i) $\frac{dy}{dx}$, (1 mark)
- (ii) $\frac{d^2y}{dx^2}$, (1 mark)
- (iii) the coordinates of the turning points, (4 marks)
- (iv) the maximum value and minimum value of the turning points. (2 marks)

Question 4

- (a) The demand function, in ringgit, for x units of an item is given by $p = 300 - 0.003x$. The total cost, in ringgit, to manufacture x units of the item is given by $C(x) = 80,000 + 50x + 0.001x^2$. Find
- (i) the fixed cost, (1 mark)
- (ii) the revenue function, (1 mark)
- (iii) the profit function, (2 marks)

(iv) the marginal profit function, (2 marks)

(v) the maximum profit obtained and the number of items that need to be manufactured. (3 marks)

(b) Given that $g(x)=ax+b$, $x \in \mathfrak{R}$ and $f(x)=x-3$, $x \in \mathfrak{R}$, where a and b are constants.

(i) If $g(1)=3$ and $g(2)=5$, find the values of a and b . (3 marks)

(ii) Find the inverse function $g^{-1}(x)$. (1 mark)

(iii) Show that $fg^{-1}(x)=\frac{x-c}{2}$ where c is an integer. (1 mark)

(iv) Find the value of x if $g(2x)=x$. (2 marks)

(v) Find the value of x if $fg^{-1}\left(\frac{x}{2}\right)=-x^2$. (4 marks)

Question 5

(a) Solve the inequality $5x+2 < x+5 < 3x+10$. (3 marks)

(b) Given that $2, \frac{1}{2}, \frac{1}{8}, \dots$ is a geometric progression. Find

(i) the 8th term, (1 mark)

(ii) the sum of the first ten terms, (2 marks)

(iii) the sum to infinity of the progression. (1 mark)

(c) Given that the third term and the sixth term of an arithmetic progression are 14 and 23 respectively.

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

- (ii) Find the sum of the first fourteen terms of the arithmetic progression. (1 mark)
- (d) A Science society committee which consists of 6 members are to be selected from 7 female members and 5 male members . Calculate the number of different committees that can be formed if
- (i) there is no restriction, (2 marks)
- (ii) there are the same number of females and males, (2 marks)
- (iii) the number of females must be more than the number of males. (4 marks)

Question 6

A college in Nilai is enrolling x students for the Art stream and y students for the Science stream. The enrolment of students is based on the following constraints.

- I The number of Science stream students is at most two times of the number of Art stream students.
- II The total number of students enrolled is not more than 150.
- III The number of Science stream students must exceed the number Art stream students by at least 20.
- (a) Write down three inequalities which satisfy the above constraints . (3 marks)
- (b) Using a scale of 1 cm to represent 10 students on both axes, construct and shade the region that satisfies the above inequalities. (7 marks)
- (c) Given that the tuition fees charged for a Science stream student and an Art stream student are RM200 and RM150 respectively. Write down the objective function for the tuition fees. (2 marks)

Hence, from your graph drawn, find

- (d) the tuition fees charged at each corner point of the feasible region. (6 marks)
- (e) the range for the number of Art stream students enrolled if the number of Science stream students enrolled is 70, (2 marks)

--THE END--

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