## FINAL Examination Paper

(COVER PAGE)

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<th>AUGUST 2014</th>
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<td>Foundation in Business Information Technology (CFPI)</td>
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<td>Course</td>
<td>MAT1215: FUNDAMENTAL OF MATHEMATICS</td>
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<td>Date of Examination</td>
<td>10th December 2014</td>
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<tr>
<td>Time</td>
<td>2.00pm – 4.00pm</td>
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This paper consists of SIX (6) questions.

Answer any FIVE (5) questions out of SIX (6) in the answer booklet provided.

Materials permitted : Non-Programmable Calculator

Materials provided : Graph Paper, Formula Booklet 1

Examiner(s) : Mr. Tan Seng Kuan

Moderator : Dr. Ng Set Foong

This paper consists of 6 printed pages, including the cover page.
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) From the set of \( \{-\frac{5}{8}, \sqrt{3}, 6.2222 \ldots, 0, \sqrt{25}, 4, -9.01020304 \ldots\} \), identify the set of:

(i) Natural numbers

(ii) Rational numbers

(iii) Irrational numbers

(iv) Integers (4 marks)

(b) Simplify and write your answers without using negative exponents.

(i) \( \left( \frac{9x^5y^{-3}}{3x^{-5}y^3} \right)^{-2} \) (3 marks)

(ii) \( \frac{4 \cdot 6x^2}{x} \cdot \frac{3x^2y}{x^5} \div \frac{3x^2y}{x^2} \) (3 marks)

(iii) \( (x^2 + y^2)^2 \) (3 marks)

(c) Factorize the following:

(i) \( 3x^3y - 4x^2y^2 - 6x^2y + 8xy^2 \) (3 marks)

(ii) \( 5x^2 - 20 \) (2 marks)

(iii) \( ax + bx - a - b \) (2 marks)
Question 2

(a) Given the following expression, rationalize the denominator and simplify:
   
   (i) \[ \frac{4}{\sqrt{3} + 2} \]  
   (3 marks)

   (ii) \[ \frac{\sqrt{2x} + 4}{2\sqrt{2x}} \]  
   (3 marks)

(b) Given that \( f(x) = 3x^3 - 2 \) and \( g(x) = \frac{2x + 3}{x - 1} \). Find
   
   (i) \( (f \cdot g)(2) \)  
   (3 marks)

   (ii) \( (g \circ f)(2) \)  
   (3 marks)

   (iii) \( g^{-1}(x) \)  
   (3 marks)

(c) Solve the following quadratic equations:
   
   (i) \( 2(x - 3)^2 = 128 \)  
   (2 marks)

   (ii) \( 2x^2 + 5x + 1 = 0 \)  
   (3 marks)

Question 3

(a) Given the function \( f(x) = -x^2 - 2x + 8 \),

   (i) find the vertex, indicating whether it is minimum or maximum.  
   (2 marks)

   (ii) find the x- and y- intercepts.  
   (3 marks)

   (iii) sketch the graph by showing the vertex, the x-intercepts and the y-intercept clearly.  
   (3 marks)

(b) If 5, 8 and 11 are the first three consecutive terms of an arithmetic sequence,

   (i) find the 30th term.  
   (3 marks)

   (ii) find the sum of the first 40 terms.  
   (3 marks)
(c) The common ratio of a geometric sequence is 3 and the fourth term is 54.

(i) find the first term of the sequence. (3 marks)
(ii) find the sum of the first 5 terms. (3 marks)

Question 4

(a) Find \( x \) and \( y \) so that
\[
\begin{pmatrix} 5 & 3x \\ 2x & -4 \end{pmatrix} + \begin{pmatrix} 1 & -4y \\ 7y & 4 \end{pmatrix} = \begin{pmatrix} 6 & -7 \\ 5 & 0 \end{pmatrix}
\]
(4 marks)

(b) If \( A = \begin{pmatrix} 2 & -2 \\ 1 & 0 \end{pmatrix}, B = \begin{pmatrix} -1 \\ 2 \end{pmatrix}, C = \begin{pmatrix} 2 & 1 \\ 1 & 3 \end{pmatrix}, D = \begin{pmatrix} 3 & -2 \\ -1 & 1 \\ 2 \end{pmatrix} \) and
\[
E = \begin{pmatrix} 3 & -4 \\ -1 & 0 \end{pmatrix},
\]
find

(i) \( E + DA \) (3 marks)
(ii) \( BC \) (3 marks)
(iii) \( CB \) (3 marks)
(iv) \( AD - BC \) (3 marks)

(c) Solve the following system of equations by the inverse matrix method:
\[
\begin{align*}
4x + 3y &= 3 \\
3x + 2y &= 5
\end{align*}
\]
(4 marks)

Question 5

(a) Given the following system of linear inequalities:
\[
\begin{align*}
2x + y &\leq 50 \\
x + 3y &\leq 90 \\
x &\geq 0 \\
y &\geq 0
\end{align*}
\]

(i) Graph the solution set and indicate whether it is bounded or unbounded. (3 marks)
(ii) Determine the coordinates of the corner points. (3 marks)

(iii) Using the corner points, find the optimal solution for the objective profit function: \( P(x) = 4x + 3y \). (2 marks)

(b) Given the equation of a curve is \( y = x^3 - 7.5x^2 + 18x + 6 \).

(i) Find \( \frac{dy}{dx} \). (1 mark)

(ii) Find \( \frac{d^2y}{dx^2} \). (1 mark)

(iii) Find the coordinates of the turning points. (3 marks)

(iv) Hence, determine whether each turning point is a maximum or minimum point. (2 marks)

(c) (i) Integrate with respect to \( x \):

\[ (2x^2 + 1)^2 \] (2 marks)

(ii) Evaluate:

\[ \int_{-1}^{2} (2x + 1)(2x - 1) \, dx \] (3 marks)

Question 6

(a) A refrigerator manufacturer can sell all the refrigerators of a particular type that he can produce. The total cost, \( C(x) \) in RM of producing \( x \) refrigerators per week is given by

\[ C(x) = 300x + 2000. \]

The price-demand equation in RM is estimated to be

\[ p = 500 - 2x \]

Find

(i) the revenue function, (2 marks)

(ii) the profit function, (2 marks)
(iii) the marginal profit function, (2 marks)

(iv) the maximum profit obtained and the number of units that need to be produced. (2 marks)

(b) Yazid wishes to have RM8500 at the end of a 6-year period. He approaches two banks and they offer the following options to him:

Bank A: 5% interest compounded annually,
Bank B: 6% simple interest annually.

Which bank should Ahmad choose and what is the difference in the amount he has to invest right now between both banks? (6 marks)

(c) A study group of 4 must be chosen from 3 female students and 4 male students. Calculate:

(i) in how many ways can the committee be chosen? (2 marks)

(ii) in how many ways 2 male students and 2 female students can be chosen? (2 marks)

(iii) in how many ways can at least 2 female students be chosen? (2 marks)

--THE END--

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