INTI International University & Colleges

FINAL
Examination Paper

(COVER PAGE)

Session	:	April 2016
Programme	:	Diploma in Business (DIB) Diploma in Finance (DIF) Diploma in Entrepreneurship (DENT)
Course	:	**MAT1106: Business Mathematics**
Date of Examination	:	27 July, 2016 (Wednesday)
Time	:	11:00am – 1:00pm Reading Time : Nil
Duration	:	2 Hours

Special Instructions :

Answer any **FIVE (5)** structured-type questions.

Materials permitted : Non-Programmable Calculator

Materials provided : Formula sheet, Graph paper

Examiner(s) : **Dinesh Kumar Govindasamy,** Fang Yen Yen, Fadiah Hirza Mohammad Ariff

Moderator : Dr Ch'ng Pei Eng

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

DIPLOMA IN BUSINES (DIB)
DIPLOMA IN FINANCE (DIF)
DIPLOMA IN ENTREPRENEURSHIP (DENT)
MAT1106: BUSINESS MATHEMATICS
FINAL EXAMINATION: APRIL 2016 SESSION

Instruction: 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) Simplify : $3\sqrt{24} + \sqrt{54}$ (3 marks)

(b) Perform : $(3x + 2)(2x^2 + x + 2)$ (2 marks)

(c) Factorize the following:

(i) $9x^2 - 4$ (2 marks)

(ii) $x^3 + 27$ (2 marks)

(d) Solve for x: $2x^2 + 4x + 1 = 0$ (4 marks)

(e) Solve for x: $\frac{x-8}{5} + 2 = -\frac{2}{5} - \frac{x}{3}$ (4 marks)

(f) Simplify : $\frac{x+2}{x-3} - \frac{x}{3}$ (3 marks)

Question 2

(a) Given $\boldsymbol{f(x) = 3x + 4}$ and $\boldsymbol{g(x) = x^2 + 2x}$.

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

(ii) $f(-1) - g\left(\frac{3}{2}\right)$ (3 marks)

(b) Find the equation of the line that passes through the point $(-2, -3)$ and parallel to the line with the equation, $2x + 3y = 6$ (4 marks)

(c) Given $f(x) = x^2 - 2x - 15$, sketch the graph of $f(x)$ and indicate the vertex, y-intercept and x-intercept clearly. (7 marks)

(d) Differentiate the following with respect to x :

(i) $f(x) = -2(x^2 + x)^4$ (2 marks)

(ii) $f(x) = (x - 1)(x^2 - 2x + 4)$ (2 marks)

Question 3

(a) Given the first four terms of a geometric progression is $54, 18, 6, 2 \ldots$ Find the sum of the first 7 terms. (3 marks)

(b) Given the first four terms of an arithmetic progression is $2, 7, 12, 17 \ldots$ Find the sum of the first 50 terms. (3 marks)

(c) Great Income Life offered an annuity that pays 8.5% compounded monthly. If RM 4000 is deposited into this annuity every month, how much is in the account after 15 years? How much of this is interest? (6 marks)

(d) The total cost of producing x roller skates is $c(x) = 0.1x^2 + 8x + 100$ and the roller skate is sold at RM 50 per unit.

(i) Find the profit function. (2 marks)

(ii) Find the marginal profit and the number of roller skates that had to be sold to achieve the maximum profit? (4 marks)

(iii) Find the value of the maximum profit. (2 marks)

Question 4

(a) Given that $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ $B = \begin{bmatrix} -3 & 1 \\ 0 & 0 \\ 1 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 0 & 2 \\ 1 & 0 & 5 \end{bmatrix}$

(i) Find $2AC$. (3 marks)

(ii) Find the matrix X if $\frac{X}{2} = CB$. (4 marks)

(iii) Hence find, $A - 2CB$ (3 marks)

(b) Solve the following system of equations by using ***any matrices method.***

$$4x + y = -14$$
$$-5x - 5y = 25$$

(5 marks)

(c) The revenue and cost functions for a company that manufactures headphone set for MP3 players were determined to be:

$$\boldsymbol{R(x) = 10x - 0.001x^2} \qquad \boldsymbol{C(x) = 7000 + 2x}$$

Find the break-even coordinates. (5 marks)

Question 5

(a) Solve the system of inequalities graphically and find the ***maximum*** value of $\boldsymbol{p = -x + 4y}$.

$$y \geq x - 2$$
$$0 \leq x \leq 5$$
$$0 \leq y \leq 4$$

(7 marks)

(b) Solve : $\int_0^3 (x-1)^3 \, dx$ (5 marks)

(c) RM 15,000 is invested for 5 years 6 months in a bank earning a simple interest rate of 8.2% per annum. Find the simple amount at the end of the investment. How much interest is earned? (5 marks)

(d) Find the equation of the line that passes through the point $P(2, 3)$ and $Q(-1, 9)$. (3 marks)

Question 6

(a) If RM 20 000 is invested at 7.5% compounded monthly. What is the amount after 17 years? (4 marks)

(b) A company estimates that it will need RM 120,000 in 7 years to replace a system. They establish a sinking fund by making fixed monthly payment into an account paying 4.5% compounded monthly. How much each payment should be? How much interest is earned? (6 marks)

(c) Find the turning point of the curve $y = x^2 - x + 2$ and determine whether the turning point is maximum or minimum. (5 marks)

(e) Gadgets World Co. has recorded the number of orders each month:

Month	Orders
1	1350
2	1300
3	1250
4	1350
5	1150
6	800
7	1050

(i) Use a three-month moving average ($k = 3$) for the company complaints to forecast for the month 6 and thus find the forecast error for the month 6. (3 marks)

(ii) Use a five-month moving average ($k = 5$) for the company complaints to forecast for the month 8. (2 marks)

~ The End ~

Formulas: MAT1106 (BUSINESS MATHEMATICS)

1) *Quadratic Formula :* $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

2) *Vertex of a parabola:* $f(x) = ax^2 + bx + c$: $\left[-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right]$

3) *Differentiation properties :*

$$\frac{d}{dx}x^n = nx^{n-1}$$

$$\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + f'(x)g(x),$$

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$$

4) *Integration properties :*

$$\int z^r\,dz = \frac{z^{r+1}}{r+1} + C$$

$$\int_a^b f(x)\,dx = F(b) - F(a).$$

5) *Compound interest:* $A = p(1 + \frac{r}{k})^{kt}$

6) *Continuous compound interest:* $A = Pe^{rt}$

7) *Arithmatic sequances:*

i. $a_n = a_1 + (n-1)d$

ii. $S_n = \frac{n(a_1+a_n)}{2}$