INTI International University & Colleges

FINAL
Examination Paper

(COVER PAGE)

Session	:	January 2017
Programme	:	Diploma in Business (DIB)
Course	:	**MAT1106: Business Mathematics**
Date of Examination	:	09 March, 2017 (Thursday)
Time	:	8:00am – 10:00am 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**, Billy Siew, Cetha Achutan Nair and Si Chong En
Moderator	:	Dr Ch'ng Pei Eng

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

DIPLOMA IN BUSINESS PROGRAMME (DIB)
MAT1106: BUSINESS MATHEMATICS
FINAL EXAMINATION: JANUARY 2017 SESSION

Instruction: This paper consists of **SIX (6)** structured-type questions. Answer **FIVE (5)** out of SIX structured-type the questions in the answer booklet provided. All questions carry equal marks of 20 marks.

Question 1

(a) Simplify the following:

(i) $\sqrt{27} - \sqrt{72} + \sqrt{32}$ (3 marks)

(ii) $\left(\frac{2x^2y^3}{3x^3y^4}\right)^2$ (3 marks)

(b) Expand: $(x-2)^2 - (-x^2 + 3x)$ (2 marks)

(c) Factorize the expression completely: $9x^2 - 64$ (2 marks)

(d) Simplify:

$$\frac{2}{x-1} - \frac{x}{x+1}$$

(3 marks)

(e) Solve the quadratic equation by using ***formula***: $x^2 - 3x - 2 = 0$ (4 marks)

(f) Solve the equation for x: $-4x + 2(5x - 6) = -3(x + 13)$ (3 marks)

Question 2

(a) Given that $f(x) = 2x$ and $g(x) = x^2 + 3$, find

(i) $f(x) + g(x)$ (1 mark)

(ii) $f(-2) - g(3)$ (3 marks)

(iii) the value(s) of x if: $f(x) + g(x) = 11$ (3 marks)

(b) Write an equation of a line which is *parallel* to the line $y = 2x - 3$ and passing through the point $(1, 3)$. (3 marks)

(c) Given $f(x) = x^2 - 4x - 12$, sketch the graph of $f(x)$ by indicating the *vertex point*, $y - intercept$ and $x - intercept$ clearly. (6 marks)

(d) Find the equation of a line that passes through the points $(2,-4)$ and $(6,2)$. (4 marks)

Question 3

(a) Differentiate the following with respect to x :

(i) $y = (6x^2 + 2x)^{-3}$ (3 marks)

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

(b) The revenue and cost functions in ringgit of a product are given as:

$$R(x) = 600x - x^2$$

$$C(x) = 200 + 6x + 2x^2$$

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

(ii) Determine the production level that earns the company maximum profit and find the company's *maximum* profit. (6 marks)

(iii) Currently the company is producing 100 units of the product. Should the company increase or decrease production? (2 marks)

(c) Evaluate the integral

$$\int_0^2 (8x^3 + 6x^2 - 2x)dx$$

(5 marks)

Question 4

(a) RM 20,000 is invested for two years in a bank, earning a simple interest rate of 4.5% per annum.

(i) Find the simple amount at the end of the investment period. (3 marks)

(ii) Determine the amount of interest earned on this investment. (I mark)

(b) Find the future value of RM 40,000 which was invested for 5 years at 4.2% compounded quarterly. (3 marks)

(c) Find the future value of an ***annuity*** of RM 12,000 every year for 10 years at 8% compounded *annually*. (4 marks)

(d) Find the present value of an ***annuity*** of RM 800 every month for 5 years at 5% compounded monthly. (4 marks)

(e) Sam bought a new car and took a loan of RM 90,000 from a bank that offers him an interest rate of 2.9% per annum, compounded monthly for 6 years. Find Sam's monthly payment and the amount of interest Sam paid on his loan. (5 marks)

Question 5

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

(i) Find $2A + 2B$ (3 marks)

(ii) Find $2(AB)$ (4 marks)

(iii) Find B^{-1} (3 marks)

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

$$-5x - 5y = 25$$
$$-2x - 4y = 16$$

(4 marks)

(c) Given the first three terms of a geometric progression are: $40, 20, 10, \ldots$

(i) Find the 5^{th} term of the progression. (3 marks)

(ii) Find the sum of first 7 terms of the progression. (3 marks)

Question 6

(a) If $P = -x + 2y$, find the ***maximum*** value of P subject to the given constraints:

$$y \geq x - 3$$
$$y \geq -x - 1$$
$$0 \leq y \leq 3$$
$$x \geq 0$$

(6 marks)

(b) The table below shows the sales of L.E.D Television over the last 8 years.

Year	1	2	3	4	5	6	7	8
Revenue in Millions of Ringgit	75	76.5	81	82	81.5	83	83	84.5

Use a three-year moving average for the department store sales to forecast the sales for year 5 and thus find the forecast error for year 5. (3 marks)

(c) Find the coordinates of the turning point of the following curves and determine their nature.

(i) $y = x^2 - x - 2$ (4 marks)

(ii) $y = -2x^2 + 7x - 1$ (4 marks)

(d) Solve for x: $2\sqrt{x+3} = 8$ (3 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 :***

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

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

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

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) $C(x) = F + v_x$

6) $R(x) = P.x$

7) $P(x) = R(x) - C(x)$

8) Break Eve : $R(x) = C(x)$

9) ***Compound interest:*** $S = P(1+\frac{r}{k})^{kt}$

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

11) ***Arithmatic sequances:***

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

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

12) ***Geometric sequances:***

i. $a_n = a_1 r^{n-1}$

ii. $S_n = \frac{a_1 - a_1 r^n}{1-r} \qquad r < 1$

iii. $S_n = \frac{a_1 r^n - a_1}{r-1} \qquad r > 1$

13) ***Simple interest*** : $I = Prt$

14) ***Simple Amount*** : $S = P(1 + rt)$

15) ***Future value*** : $FV = PMT\left[\frac{(1+\frac{r}{k})^{kt}-1}{\frac{r}{k}}\right]$

16) ***Sinking fund*** : $PMT = FV\left[\frac{\frac{r}{k}}{\left(1+\frac{r}{k}\right)^{kt}-1}\right]$

17) ***Present value*** : $PV = PMT\left[\frac{1-\left(1+\frac{r}{k}\right)^{-kt}}{\frac{r}{k}}\right]$

18) ***Amortization*** : $PMT = PV\left[\frac{\frac{r}{k}}{1-(1+\frac{r}{k})^{-kt}}\right]$

19) ***Inverse matrix*** : $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \text{---} A^{-1} = \frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$