INTI International University & Colleges

FINAL
Examination Paper

(COVER PAGE)

Session	:	**AUGUST 2017**
Programme	:	Diploma in Business (DIB)
Course	:	**MAT1106: Business Mathematics**
Date of Examination	:	12 December, 2017 (Tuesday)
Time	:	5:00 pm – 7:00 pm Reading Time : Nil
Duration	:	2 Hours

Special Instructions :

This paper consists of **SIX (6)** questions.
Answer any **FIVE (5)** questions in the answer booklet provided.

Materials permitted : Non-Programmable Calculator

Materials provided : Formula sheet, Graph paper

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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: AUGUST 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) $-3\left(\sqrt{27}+\sqrt{48}\right)$ (3 marks)

(ii) $\dfrac{x^{-2}y^{-3}}{x^5y^2}$ (2 marks)

(b) Expand: $(x+1)^2+(3x^2+2x)$ (2 marks)

(c) Factorize the expression completely: $64x^2-4$ (3 marks)

(d) Simplify:

$$\frac{2}{x+2}+\frac{x}{x^2-4}$$

(3 marks)

(e) Solve the quadratic equation by using quadratic ***formula***: $3x^2+10x-25=0$ (4 marks)

(f) Solve the equation for x: $-2x+2(3x-6)=-3x+9$ (3 marks)

Question 2

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

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

(ii) the value(s) of x if, $f(x)+g(x)=3$. (3 marks)

(b) Write the equation of a line that passes through the point $(-1,-3)$ and $(2,-2)$. (5 marks)

(c) Given $f(x) = -x^2 - 8x - 12$, sketch the graph of $f(x)$ by indicating the *vertex point*, $y - intercept$ and $x - intercept$ clearly. (7 marks)

(d) Solve for x: (2 marks)

$$\frac{2 - 2x}{3} \leq 6$$

Question 3

(a) Differentiate the following with respect to x :

(i) $y = (2x + 3)^2$ (2 marks)

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

(b) The price demand in ringgit of a product is given as:

$$p = 2,000 - 4x$$

(i) Determine the revenue function (1 mark)

(ii) Determine the production level that earns the company maximum revenue and find the company's maximum revenue. (5 marks)

(iii) How much should each product be sold to achieve maximum revenue? (2 marks)

(c) Evaluate the integral. (5 marks)

$$\int_{-1}^{1} (x^3 + 6x^2 - 2x)dx\,.$$

(d) Solve for x: (2 marks)

$$\frac{\sqrt{x} - 16}{4} = 5$$

Question 4

(a) RM 10,200 is invested for five years in a bank, earning a simple interest rate of 6.4% per annum. Find the simple amount at the end of the investment period. (2 marks)

(b) Find the future value of RM 100,000 which was invested for 5 years at 4.4% compounded annually. Hence find the interest earned. (4 marks)

(c) Find the future value of an annuity of RM 150, invested every month for 20 years at 6.5% compounded monthly. Hence, find the interest earned. (4 marks)

(d) Find the present value of an annuity of RM 80,000 yearly for 6 years at 4.3% compounded annually. How much interest was earned? (4 marks)

(e) Find the amount that must be deposited monthly at 6.1% compounded monthly for 7 years to accumulate an amount of RM 80,000. (3 marks)

(f) A loan of RM 72,000 at 2.6% compounded monthly is to be amortized for 7 years. Calculate the monthly payment. (3 marks)

Question 5

(a) Given matrix $A = \begin{bmatrix} 1 & 2 \\ 1 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

(i) Find $B - 3A$. (3 marks)

(ii) Find $3(BA)$. (4 marks)

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

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

$$-4x + 9y = 9$$
$$x - 3y = -6$$

(4 marks)

(c) Given the first four terms of a geometric sequence are: $3, -6, 12, -24$ ...

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

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

Question 6

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

$$y \leq -x + 8$$
$$y \geq -x + 4$$
$$0 \leq y \leq 5$$
$$0 \leq x \leq 5$$

(7 marks)

(b) The table below shows the sales of product over the last 9 years.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016
Sales in (RM Millions)	50	55	55	57	56.5	56.9	57.3	57.8	58

Use a five-year moving average of the sales to forecast for year 2016 and find the forecast error for year 2016. (4 marks)

(c) Find the coordinates of the turning points on the curve $y = x^3 - 6x^2 + 12x - 5$ and determine their nature. (5 marks)

(d) Solve for x:

$$\frac{3x}{x+3} + \frac{2}{5} = -2$$

(4 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. $s_n = \frac{a_1 - a_1 r^n}{1-r}$ $\quad r < 1$

iii. $s_n = \frac{a_1 r^n - a_1}{r-1}$ $\quad r > 1$

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

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

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

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