INTI International University & Colleges

FINAL
Examination Paper

(COVER PAGE)

Session	:	**APRIL 2018**
Programme	:	Diploma in Business (DIB)
Course	:	**MAT1106: Business Mathematics**
Date of Examination	:	July 31, 2018 (Tuesday)
Time	:	5:00pm – 7:00pm 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

Examiner(s)	:	**Hatin Fatihah,** Choong Yin Ling, Michelle Chong, Tan Yue Lee, Billy Siew Woo Bing and Cetha Achutan Nair
Moderator	:	Dr Ch'ng Pei Eng

*This paper consists of **6** printed pages, including the cover page*

DIPLOMA IN BUSINESS PROGRAMME (DIB)
MAT1106: BUSINESS MATHEMATICS
FINAL EXAMINATION: APRIL 2018 SESSION

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

Question 1

(a) Simplify the following:

(i) $-2\left(\sqrt{75}-\sqrt{147}\right)$ (3 marks)

(ii) $\left(\dfrac{5m^{-2}n^{3}}{10n^{-1}m^{2}}\right)^{-1}$ (4 marks)

(iii) $\left(x^{3}+x^{2}+1\right)\left(x^{2}-1\right)$ (2 marks)

(b) Factorize the expression completely: $5-180x^{2}$. (3 marks)

(c) Solve the quadratic equation by using formula: $25x^{2}-40x+7=0$. (4 marks)

(d) Solve the equation: $\dfrac{4x+5}{3x}+\dfrac{2x+1}{x}=4$. (4 marks)

Question 2

(a) Given that $f(x)=8-3x$ and $g(x)=(x-1)^2$. Find

(i) $2g(3)-f\left(\frac{2}{3}\right)$.

(3 marks)

(ii) Solve for x if $-\frac{x}{3}f(x)=g(x)$.

(4 marks)

(b) Find the equation of the line that passes through the point (5, -2) and perpendicular to the line $x=\frac{8y+3}{2}$.

(5 marks)

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

(8 marks)

Question 3

(a) Differentiate $y=\left(x^2+5x\right)^{-2}$ with respect to x:

(3 marks)

(b) A manufacturer sells x units of smartphones per year at a price of RMp per unit, where x is in millions. The demand function for the smartphone is $p(x)=1500-5x$. The total cost function, in RM, of manufacturing x units of smartphone is given by, $C(x)=5000+350x$.

(i) Write down the revenue function.

(1 mark)

(ii) Find the profit function.

(2 marks)

(iii) Determine the output level to maximize the profit and find the maximum profit.

(5 marks)

(iv) Find the price per unit for the smartphone.

(2 marks)

(c) Find $\int_{\frac{1}{2}}^{0}(x-2)^2\,dx$. (5 marks)

(d) Integrate $\int\left(\sqrt{x}-x\right)dx$. (2 marks)

Question 4

(a) Kim wants to further study and the study fees is about RM 65,000.

(i) She applies for personal loan from a bank with 4.4% interest compounded monthly for 7 years. What is her monthly installment? (3 marks)

(ii) What is the total charged amount for the interest from bank? (2 marks)

With the monthly installment, Kim realizes that she cannot afford to pay the monthly installment. She can only afford to pay RM 500 per month.

(iii) What is the amount of loan that Kim can apply with RM 500 monthly installment? (3 marks)

(b) If RM5,500 is invested at a simple interest rate of 2.5% per annum, what is the simple amount after 10 years?

(2 marks)

(c) Find the future value of RM 200,000 which was invested for 5 years at 4.5% compounded annually. Find the interest earned.

(4 marks)

(d) After attending a financial workshop, Sophia realizes that she needs money for her 7-year old daughter's college fund. She plans to deposit every month RM 500 into an account with 3.45% interest compounded monthly. What is the amount for her daughter's college fund when her daughter is 18 years old?

(3 marks)

(e) Find the amount that must be deposited monthly at 5.1% compounded monthly for 5 years to accumulate an amount of RM 95,000.

(3 marks)

Question 5

(a) Given matrix $A=\begin{bmatrix}2 & 1\\ 1 & 4\end{bmatrix}, B=\begin{bmatrix}-1 & 2\\ 2 & 3\end{bmatrix}$ and $C=\begin{bmatrix}2 & 0 & -1\\ -1 & 2 & 2\end{bmatrix}$. Find:

(i) $2B-A$

(3 marks)

(ii) $2AB$

(4 marks)

(iii) $\left(A^T\right)^{-1}$

(4 marks)

(iv) $C^T A$

(3 marks)

(b) The Instant Paper Clip Office Supply Company sells and delivers office supplies to companies, schools, and agencies. From the records of previous orders, management has accumulated the following data for the past 10 months.

Months	**Orders**
January	120
February	90
March	100
April	75
May	110
Jun	50
July	75
August	130
September	110
October	96

(i) Use three-month moving average of the orders to forecast for October and find the forecast error for October. (4 marks)

(ii) Use five-month moving average of the orders to forecast for November.

(2 marks)

Question 6

(a) If $P = 8x + 7y$, find the maximum value of P subject to the given constraints:

$$6x + 8y \leq 800$$
$$x + 5y \leq 410$$
$$4x + 2y \leq 350$$
$$x \geq 0, y \geq 0$$

(9 marks)

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

$$2x - 3y = 3$$
$$5x = 3y + 12$$

(4 marks)

(c) Find the coordinates of the turning points of the given curve and determine their nature.

$$f(x) = x^3 - 2x^2 + 10$$

(7 marks)

~ The End ~

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

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