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FINAL
Examination Paper

(COVER PAGE)

Session	:	**JANUARY/ MARCH 2018**
Programme	:	Diploma in Business (DIB)
Course	:	**MAT1106: Business Mathematics**
Date of Examination	:	7 March, 2018 (Wednesday)
Time	:	8:00 am- 10:00 am 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 7 printed pages, including the cover page

DIPLOMA IN BUSINESS PROGRAMME (DIB)
MAT1106: BUSINESS MATHEMATICS
FINAL EXAMINATION: JANUARY/ MARCH 2018 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) $-2\left(\sqrt{75}-\sqrt{147}\right)$

(3 marks)

(ii) $\dfrac{2abc^2}{-ab^2c^3}$

(2 marks)

(iii) $2(x-2)^2-2\left(x^2-6x\right)$

(2 marks)

(b) Factorize the expression completely: $64x^2-4y^4$

(3 marks)

(c) Simplify:

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

(3 marks)

(d) Solve the quadratic equation by quadratic formula: $3x(3x-2)=8$

(4 marks)

(e) Solve the equation: $20-\dfrac{x}{3}=\dfrac{x}{2}$

(3 marks)

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Question 2

(a) Given that $f(x)=\frac{3x+5}{3x}, x\neq 0.$

(i) Calculate $f(3)-f(\frac{1}{3})$.

(3 marks)

(ii) Solve for x if $f(x)=\frac{7}{2}$.

(3 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.

(7 marks)

(d) Solve:

$$\frac{5}{6}x+3=\frac{-9}{4}$$

(2 marks)

Question 3

(a) Differentiate the following with respect to x:

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

(2 marks)

(ii) $y=(x^3+4)(x^2+3)$

(3 marks)

(b) A company manufactures and sells x soaps per month. The price of the soap given as $p = 500 - 10x$ and the cost function is given by $C(x) = 100x + 1000$. Find

(i) the marginal profit function.

(3 marks)

(ii) the output level to maximize profit.

(3 marks)

(iii) the maximum profit.

(2 marks)

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

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

(2 marks)

Question 4

(a) If RM2,500 is invested at a simple interest rate of 8.5% per annum, what is the simple amount after 7 years?

(2 marks)

(b) Suppose RM 200,000 was invested for 5 years at 4.5% compounded annually. Find the future value.

(4 marks)

(c) Suppose an annuity of RM220 invested every month for 25 years at 6.5% compounded monthly. Find the future value.

(4 marks)

(d) Find the present value of annuities of RM 100,000 yearly for 5 years at 4.4% compounded annually. How much interest was earned?

(4 marks)

(e) Find the amount that must be deposited monthly at 6.1% compounded monthly for 5 years to accumulate an amount of RM 75,000.

(3 marks)

(f) A loan of RM 85,000 at 3.5% compounded monthly is to be amortized for 10 years. Calculate the monthly payments.

(3 marks)

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Question 5

(a) Given matrix $A=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$ and $B=\begin{bmatrix}2 & 2\\ 4 & 5\end{bmatrix}$. Find

(i) $2B-A$

(3 marks)

(ii) $3(BA)$

(4 marks)

(iii) B^{-1}

(3 marks)

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

$$4x+4y=60$$
$$x=25-3y$$

(4 marks)

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

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

(3 marks)

(ii) Find the sum of the first 6 terms of the sequence.

(3 marks)

Question 6

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

$$y\le -x+8$$
$$y\ge -x+4$$
$$0\le y\le 5$$
$$0\le x\le 5$$

(7 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

Use five-years moving average of the orders to forecast for October and find the forecast error for October. (4 marks)

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

$$f(x)=x^3+6x^2+9x+3$$

(9 marks)

~THE END~

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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 :*** $\boldsymbol{S = P(1+rt)}$

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