

FINAL

Examination Paper

(COVER PAGE)

Session : AUGUST 2018

Programme : Diploma in Business (DIB)

Course : **MAT1106: Business Mathematics**

Date of Examination : 12 December 2018, (Wednesday)

Time : 11:00am – 1:00pm 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

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Moderator : Dr Ch'ng Pei Eng

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

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

Instructions: 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) $-3(2\sqrt{8} + \sqrt{128})$ (3 marks)

(ii) $\frac{2x^{-1}y^{-2}}{6x^4y^{-3}}$ (2 marks)

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

(c) Factorize the expressions completely: $9x^4 - 36x^2$ (3 marks)

(d) Simplify:

$$\frac{2x}{x+3} \div \frac{x}{x^2-9}$$

(2 marks)

(e) Solve the quadratic equation by using *formula*: $2x^2 - 14x - 13 = 0$ (4 marks)

(f) Solve the following equation for x : $(x - 3)(x + 4) - 2(3x - 2) = (x - 4)^2$ (4 marks)

Question 2

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

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

(ii) the value(s) of x if: $f(x) - g(x) = 4$ (3 marks)

(b) Write the equation of a line that passes through the point $(-2, -3)$ and $(1, -4)$. (5 marks)

(c) Given $f(x) = -x^2 + 4x + 5$, sketch the graph of $f(x)$ by indicating the *vertex point*, *y - intercept* and *x - intercept* clearly. (7 marks)

(d) Solve for x :

$$\frac{1-x}{3} \leq 5$$

(2 marks)

Question 3

(a) Differentiate the following with respect to x :

(i) $y = 5x^4 - 8x^3 + 6x^2 + x - 1$ (2 marks)

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

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

$$p = 3,500 - 5x$$

(i) Determine the production level that earns the company maximum revenue and find the company's maximum revenue. (6 marks)

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

(c) Evaluate the integral

$$\int_{-1}^2 (10x^4 + 3x^2 - x) dx$$

(5 marks)

(d) Solve for x :

$$\frac{\sqrt{x} + 16}{5} = 5$$

(2 marks)

Question 4

(a) RM 99,250 is invested for five years in a bank, earning a simple interest rate of 6.25% per annum. Find the simple amount at the end of the investment period. (2 marks)

(b) Find the accumulated amount of RM 110,000 which is invested for 5.5 years at 4.15% compounded quarterly. Hence, find the interest earned. (4 marks)

(c) Find the future value of annuities for RM 350, invested every month for 21 years at 5.4% compounded monthly. How much interest is being earned? (4 marks)

(d) Find the present value of annuities of RM 10,200 yearly for 6 years at 4.3% compounded annually. How much is the interest earned? (4 marks)

(e) Find the amount that must be deposited monthly at 4.1% compounded monthly for 10 years to accumulate an amount of RM 800,000. (3 marks)

(f) A loan of RM 75,000 at 3.9% compounded monthly is to be amortized for 8 years. Calculate the monthly repayments. (3 marks)

Question 5

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

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

(ii) Find $-2(BA)$ (4 marks)

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

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

$$4x + 2y = 20$$

$$7x - 3y = 9$$

(4 marks)

(c) Given the first three terms of a geometric progression are: 324, 108, 36, 12 ...

(i) Find the 6th term of the sequence. (3 marks)

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

Question 6

(a) If $P = 3x - y$, find the **maximum** value of P subject to the given constraints:

$$y \leq -x + 11$$

$$y \leq 9$$

$$x \leq 7$$

(6 marks)

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

Year	2010	2011	2012	2013	2014	2015	2016
Sales in (RM Millions)	50.2	55.14	54.9	56.05	56.325	56.59	57.315

Use a five-years 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 point of the given curves and determine their nature.

$$y = -x^3 - 3x^2 + 9x - 5$$

(6 marks)

(d) Solve for x:

$$\frac{3x}{x+3} + \frac{3}{2} = 4$$

(4 marks)

~THE END~

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Formulas: (BUSINESS MATHEMATICS) MAT1106

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) $R(x) = P \cdot x$

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

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

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

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