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FINAL
Examination Paper

(COVER PAGE)

Session	:	**January 2015**
Programme	:	Diploma In Business (DIB)
Course	:	**MAT1106 : Business Mathematics**
Date of Examination	:	March 16, 2015
Time	:	2:00pm – 4:00pm 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)	:	**Mr. Dinesh Kumar,** Billy Siew Woo Bing, Fang Yen Yen, Saemila Devi, Cetha Achutan.
Moderator	:	Dr. Ch'ng Pei Eng

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

INTI INTERNATIONAL COLLEGE SUBANG

DIPLOMA IN BUSINES PROGRAMME (DIB)
MAT1106 : BUSINESS MATHEMATICS
FINAL EXAMINATION : JANUARY 2015 SESSION

Instructions: This paper consists of **SIX (6)** questions. Answer any **FIVE (5)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Simplify the following:

(i) $\frac{\sqrt{27}}{3}+2\sqrt{12}$ (4 marks)

(ii) $\frac{2\sqrt{3}}{\sqrt{3}-2}$ (4 marks)

(b) Simplify without leaving negative exponents.

$$\left(\frac{a^{-4}b^2}{ba^2b^{-6}}\right)^2$$ (3 marks)

(c) Factorize: $4x^2-25y^2$ (3 marks)

(d) Solve for x: $4x^2-12x+9=0$ (3 marks)

(e) Perform: $(x-1)^2+(x+1)^2$ (3 marks)

Question 2

(a) Given $f(x)=x^2-x-2$, sketch the graph of $f(x)$ and indicate the vertex, y-intercept and x-intercept clearly. (6 marks)

(b) Given $f(x)=x^2+2x+3$ and $g(x)=x-5$. Find the following:

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

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

(c) Differentiate the following with respect to x :

$$y = \sqrt{3x^2 + 4x}$$ (4 marks)

(d) The marketing research department for a company that manufactures and sells memory chips for microcomputers established the following revenue and cost functions:

$$R(x) = x(75 - 3x)$$
$$C(x) = 125 + 16x$$

Where x is in millions of chips and $R(x)$ and $C(x)$ are in millions of ringgits (RM). Find the break-even points to the nearest thousand chips.

(5 marks)

Question 3

(a) Given the first three terms of a geometric progression are $7, -14, 28$ ... Find:

(i) the 12^{th} term. (2 marks)

(ii) the sum of the first twelve terms. (4 marks)

(b) A promissory note will pay RM 50 000 at maturity 6 years from now. If you pay RM 28 000 for the note now, what rate compounded continuously would you earn? (5 marks)

(c) E-Loan, an online loan service, recently offers a 3 years auto loan at 7.56% compounded monthly to applicants with good credit ratings. If you have good credit rating and can afford monthly payments of $350, how much can you borrow from E-Loan? What is the total interest you will pay for this loan? (5 marks)

(d) Kim and James have set up a sinking fund in order to have $120 000 in 15 years for their children's college education. How much should be paid semi-annually into an account paying 6.8% compounded semi-annually? (4 marks)

Question 4

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

(i) Find $AC + B$ (5 marks)

(ii) Find $[B + B]^{-1}$ (4 marks)

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

$$4x + y = 10$$
$$6x - 3y = 6$$

(5 marks)

(c) Integrate the following with respect to x:

$$\int(\sqrt{x} + \frac{1}{x^2})dx$$ (3 marks)

(d) Find the equation of the line that passes through $P(-1,2)$ and $Q(3,4)$. (3 marks)

Question 5

(a) Solve the system of inequalities graphically and find the ***maximum*** value of $\boldsymbol{p = 3x + y}$.

$$-x + 3y \geq 1$$
$$5x - y \geq 9$$
$$x + y \leq 9$$
$$x \leq 5$$

(7 marks)

(b) The total cost and the total revenue (in Ringgit) for the production and sale of x jackets are given by,

$$R(x) = 200x - 0.2x^2$$
$$C(x) = 24x + 21900$$

(i) Find the profit function and marginal profit. (5 marks)

(ii) What is the maximum profit and how many jackets should be sold to achieve the maximum profit? (4 marks)

(c) Find: $\int_0^2 (3x^2 - 2x - 1)dx$ (4 marks)

Question 6

(a) If RM 50 000 is invested at 4% compounded monthly. What is the amount after 20 years? (4 marks)

(b) Solve for x:

$$1 = \frac{x+2}{x-4} + \frac{7x-42}{x-4}$$ (4 marks)

(c) The number of sales for a company over the past 7 weeks are as follows:

WEEK	SALES (RM'000)
1	53
2	48
3	50
4	56
5	60
6	55
7	62

Using a three week moving average,

(i) predict the number of sales for week 8. (2 marks)

(ii) estimate forecast error for week 6. (3 marks)

(d) Given that a geometric progression: $x + 1, 4x - 2, 5x + 2 \ldots$ Find the possible values of x. (5 marks)

(e) Perform: $(3x^2y^5) \div (6x^2y^4)$ (2 marks)

-THE END-

MAT1106(F)/JANUARY 2015

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 :***

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

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

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

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) ***Compound interest:*** $A = p(1+\frac{r}{k})^{kt}$

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

7) ***Arithmatic sequances:***

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

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

8) ***Geometric sequances***:

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

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

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

10) ***Future value*** : $FV = PMT\,\frac{(1+i)^n - 1}{i}$

11) ***Sinking fund*** : $PMT = FV\,\frac{i}{(1+i)^n - 1}$

12) ***Present value*** : $PV = PMT\,\frac{1-(1+i)^{-n}}{i}$

13) ***Amortization*** : $PMT = PV\,\frac{i}{1-(1+i)^{-n}}$

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