



FINAL
Examination Paper

(COVER PAGE)

Session : August 2014

Programme : Diploma In Business (DIB)

Course : MAT1106 : Business Mathematics

Date of Examination : December 10, 2014

Time : 11:00am – 1:00pm 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,
Mohd Shukri Bin Zamanhuri, Yong San Loo.

Moderator : Dr. Ch'ng Pei Eng

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

INTI INTERNATIONAL COLLEGE SUBANG
 DIPLOMA IN BUSINESS PROGRAMME (DIB)
 MAT1106 : BUSINESS MATHEMATICS
 FINAL EXAMINATION : AUGUST 2014 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: $3\sqrt{24} + \sqrt{54}$ (4 marks)
- (b) Rationalize the denominator: $\frac{\sqrt{x}+\sqrt{y}}{\sqrt{x}-\sqrt{y}}$ (3 marks)
- (c) Perform: $(4x + 1)(x^2 + 4x + 4)$ (3 marks)
- (d) Factorize the following:
- (i) $x^2 - 16$ (2 marks)
- (ii) $x^3 + 8$ (3 marks)
- (e) Solve for x : $2x^2 + 4x + 1 = 0$ (5 marks)

Question 2

- (a) Given $f(x) = 2x + 5$ and $g(x) = x^2 + 2x$. Find the following:
- (i) $f(x) + g(x)$ (2 marks)
- (ii) $f\left(-\frac{1}{2}\right) - g\left(\frac{3}{2}\right)$ (3 marks)
- (b) Find the equation of the line that passes through the point $(-2, -3)$ and parallel to the line $2x + 3y = 6$. (4 marks)
- (c) Given $f(x) = x^2 - 2x - 15$, sketch the graph of $f(x)$ and indicate the vertex, y -intercept and x -intercept clearly. (6 marks)
- (d) Differentiate the following with respect to x :
- (i) $f(x) = 2(3x^2 + 1)^5$ (2 marks)

(ii) $f(x) = (3x - 1)(x^2 - 2x + 4)$ (3 marks)

Question 3

- (a) A manufacturer has a monthly fixed costs of RM 100 000 and a production costs of RM 14 for each unit produced. The product sells for RM 20 for each unit.
- (i) Find the cost function. (1 mark)
- (ii) Find the profit function (2 marks)
- (iii) Calculate the profit (loss), corresponding to the production level of 12 000 and 20 000 units. (2 marks)
- (b) Given the first four terms of an arithmetic progression are $-2, -8, -14, -20 \dots$ Find the sum of the first 50 terms. (4 marks)
- (c) Great Income Life offered an annuity that pays 6.65% compounded monthly. If RM 500 is deposited into this annuity every month, how much is in the account after 10 years? How much of this is interest? (5 marks)
- (d) The total cost of producing x skateboards is $c(x) = 0.1x^2 + 8x + 100$ and the skateboard is sold at RM 20 per unit. Find the marginal profit and find the number of skateboards that had to be sold to achieve the maximum profit? (6 marks)

Question 4

(a) Given that $A = \begin{bmatrix} 2 & -1 & 3 \\ 0 & 4 & -2 \end{bmatrix}$ $B = \begin{bmatrix} -3 & 1 \\ 2 & 5 \\ -2 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 3 & 1 & 2 \\ -3 & 2 & 5 \end{bmatrix}$

- (i) Find $2A + C$ (2 marks)
- (ii) Find the matrix X if $2X = AB$ (4 marks)
- (b) Solve the system of equations by using Cramer's rule.

$$\begin{aligned} x + y + z &= 4 \\ 2x + y - z &= 1 \\ 2x - 3y + z &= 1 \end{aligned}$$

(7 marks)

- (c) Given $8x + 5, 3x, 2x - 5, \dots$ are three consecutive terms of a geometric progression. Find the value of x if $x > 0$ (3 marks)

- (d) The revenue and cost functions for a company that manufactures headphone set for MP3 players were determined to be:

$$R(x) = 10x - 0.001x^2 \qquad C(x) = 7000 + 2x$$

Find the break-even coordinates. (4 marks)

Question 5

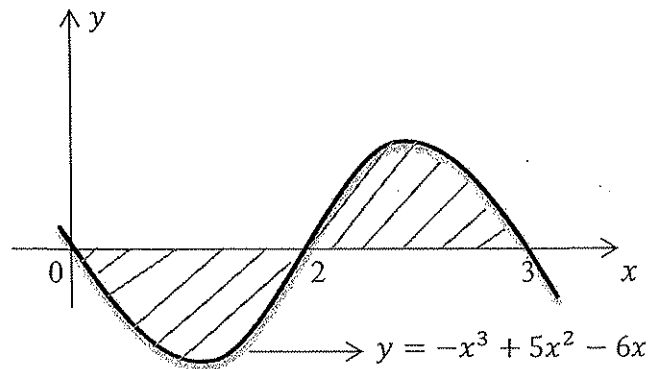
- (a) Solve the system of inequalities graphically and find the *maximum* value of $p = 10x + 30y$.

$$\begin{aligned} 2x + y &\leq 16 \\ x + 2y &\leq 14 \\ x &\geq 0 \\ y &\geq 0 \end{aligned}$$

(5 marks)

- (b) Find: $\int (4x^3 + 4x^2 - 8x) dx$ (3 marks)

- (c) Find the area of the shaded region bounded by the curve $y = -x^3 + 5x^2 - 6x$ and the x -axis: $x = 0$ to $x = 3$ as shown below.



(6 marks)

- (d) After making a down payment of RM 4000 for an automobile, Mr Chai paid RM 400/month for 36 months with interest charged at 12% a year compounded monthly on the unpaid balance. What was the original cost for the car and how much of the total car payment went towards the interest? (6 marks)

Question 6

- (a) If RM 20 000 is invested at 7% compounded quarterly. What is the amount after 17 years? (4 marks)
- (b) A company estimates that it will need RM 100 000 in 8 years to replace a computer. If they establish a sinking fund by making fixed monthly payment into an account paying 7.5% compounded monthly. How much each payment should be? (4 marks)
- (c) Find the coordinates of the turning point of the curve $y = 2x^2 - 8x + 1$ and indicate whether it is a maximum or minimum. (4 marks)
- (d) Find the inverse of the matrix $\begin{bmatrix} -5 & 3 \\ 2 & -2 \end{bmatrix}$. (4 marks)
- (e) Pandasonic Co. has recorded the number of complaints received each month. The data are as follows:

Month	Complaints
1	135
2	130
3	125
4	135
5	115
6	80
7	105

- (i) Use a three-month moving average ($k = 3$) for the company complaints to forecast for the month 6 and thus find the forecast error for the month 6. (2 marks)
- (ii) Use a three-month moving average ($k = 3$) for the company complaints to forecast for the month 8. (2 marks)

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

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

7) **Arithmetic sequences:**

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

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

8) *Geometric sequences:*

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