



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2017/2018**

COURSE NAME : MATHEMATICS FOR MANAGEMENT
COURSE CODE : BPA 12203
PROGRAMME CODE : BPA / BPB / BPC / BPP
EXAMINATION DATE : DECEMBER 2017 / JANUARY 2018
DURATION : 3 HOURS
INSTRUCTION : ANSWERS ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

- Q1** (a) Determine the number of arrangements as such that all the letters in the word 'TENGAH' be arranged with the condition that consonants are placed in odd position. (2 marks)

- (b) Given the digits 0, 1, 2, 3, 4, 5 and 6.

Calculate the number of arrangements of different four-digit numbers can be formed with the condition that these numbers are greater than 4000. (2 marks)

- (c) A team is to be formed comprised of four persons, among ten men and eight women.

Find the number of possible teams that can be formed if:

- (i) The team must have at most one man. (3 marks)

- (ii) The team must have at least two men. (3 marks)

- (d) Let four Mathematics books are selected from six different Mathematics books and three English books are chosen from five different English books.

Calculate the number of arrangements of the selected seven books on a shelf if:

- (i) The four Mathematics books remain together. (5 marks)

- (ii) A Mathematics book is at the beginning and an English book is in the middle of the shelf. (5 marks)

- Q2** (a) Let

$$A = \begin{bmatrix} 10 & 0 & 20 \\ 10 & 20 & 10 \\ 5 & 10 & 30 \end{bmatrix} \text{ and } B = \begin{bmatrix} 10 & 4 & -8 \\ -5 & 4 & 2 \\ 0 & -2 & 4 \end{bmatrix}$$

- (i) Compute AB . (3 marks)

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- (ii) Using AB , or otherwise, find the inverse of A . (4 marks)

- (b) Louis feeds his rabbits with mixtures of three different types of food, namely, food X, food Y and food Z. He intends to feed his rabbits the correct amount of food for each type to satisfy their exact daily requirements for protein, carbohydrate, and vitamins. The amount of each nutrient in milligram (mg) of each food is given in the following table:

Table Q2(b): Amount of nutrient in milligram(mg) of each food

	Food X	Food Y	Food Z
Protein	10	0	20
Carbohydrates	10	20	10
Vitamins	5	10	30

- (i) Write down the **THREE (3)** linear equations from the above information as a matrix equation in the form of $AX = B$. (3 marks)
- (ii) Calculate the amount of each type of food Louis should feed his rabbits daily to satisfy their nutrient requirements. (10 marks)

- Q3** (a) The Hickory Cabinet and Furniture Company produces sofas, tables, and chairs at its plant in Batu Pahat, Johor. The plant uses two main resources to make furniture: wood and labor. The warehouse has a total capacity of 650 pieces of furniture. The resource requirements for each piece of furniture and the total resources available weekly are summarized in **Table Q3(a)** as follows:

Table Q3(a): Resource requirements for each piece of furniture

	Wood (meter)	Labor (hour)	Profit (RM)
Sofa	7	6	400
Table	5	9	275
Chair	4	5	190
Total available resources	2,250	240	

Formulate a linear programming model to maximize the profit.

(4 marks)



(b) Consider the following linear programming model:

Minimise and maximise

$$Z = 2x + 3y$$

subject to

$$x + y \leq 30$$

$$x - y \geq 1$$

$$x \leq 20$$

$$y \geq 3$$

$$y \leq 12$$

$$x, y \geq 0$$

- (i) Illustrate the linear programming model by sketching a graph. (6 marks)
- (ii) Compute the maximum solution and maximum value. (5 marks)
- (iii) Compute the minimum solution and minimum value. (5 marks)

Q4 (a) Calculate $f'(x)$ for:

(i) $f(x) = \ln(x^3 - 2x)$ (3 marks)

(ii) $f(x) = (x^3 + 5)^7$ (3 marks)

(iii) $f(x) = (3x - 5)e^{-2x}$ (5 marks)



(b) Suppose that the demand equation for a company is $p = 200 - 3x$ and the cost function is $C(x) = 75 + 80x - x^2$.

- (i) Derive the profit function. (3 marks)
- (ii) Estimate the level of output which will maximise the profit. (3 marks)
- (iii) Determine the price and total profit for this level of production. (3 marks)

- Q5** (a) Find the area of the region enclosed by $y = 4x - x^2 + 8$ and $y = x^2 - 2x$. (4 marks)
- (b) The area of a healing skin wound changes at a rate given approximately by:

$$\frac{dA}{dt} = -5t^{-2} \quad 1 \leq t \leq 5$$

where t is time in days. Let $A(t) = 5$ square centimeters (cm^2) when $t = 1$ day.

Predict the time period in days, for the area of a healing skin wound to reach 4 cm^2 . (6 marks)

- (c) An average student enrolled in a typing class progressed at a rate of $N'(t) = 7e^{-0.1t}$ words per minute t weeks after enrolling in a 15-week course. It is assumed that a student could type 25 words per minute at the beginning of the course.

Estimate the number of words per minutes $N(t)$, a student is expected to type after completing the course.

(10 marks)

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-END OF QUESTIONS -

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Combinatorics

Permutation:

$$\frac{n!}{(n-k)!} = {}^n P_k$$

Combination:

$$\frac{n!}{(n-k)!k!} = {}^n C_k$$

Differentiation

Sum rule:

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

Product rule:

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

Quotient rule:

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

Derivative of logarithm function:

$$\frac{d}{dx} [\ln f(x)] = \frac{f'(x)}{f(x)}$$

Derivative of exponential function:

$$\frac{d}{dx} [e^{f(x)}] = f'(x)e^{f(x)}$$

Integration

Basic integration:

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$$

Definite integral:

$$\int_a^b f(x) dx = [F(x)]_a^b = F(b) - F(a)$$

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