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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	MATHEMATICS FOR MANAGEMENT
COURSE CODE	:	BPA 12203
PROGRAMME CODE	:	BPA / BPB / BPC / BPP
EXAMINATION DATE	:	DECEMBER 2018 / JANUARY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWERS **ALL** QUESTIONS

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

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Q1 (a) Two lines are parallel. On the first line, ten points are marked. On the second line, eleven points are marked.

Calculate the number of triangles can be formed by drawing straight lines that connect any three points.

(4 marks)

(b) The letters of the word '*BILANG*' are arranged so that the first letter is '*N*' and the vowels are always next to each other.

Find the possible number of arrangements.

(4 marks)

(c) David has to paint a wall with seven horizontal stripes. He only has enough paint for four similar red stripes, four similar blue stripes, and four similar yellow stripes. He can use only two colors.

Compute the number of different ways he can paint the wall.

(6 marks)

(d) A committee of 6 is to be chosen from 10 men and 7 women so as to contain at least 3 men and 2 women.

Calculate the number ways this can be done if two particular women are never together.

(6 marks)

Q2 (a) Let

$$A=\begin{bmatrix} 3 & -1 & 0 \\ 2 & 5 & 1 \\ -7 & 1 & 3 \end{bmatrix} \text{ and } B=\begin{bmatrix} 6 & -1 & 0 \\ 0 & 1 & -2 \\ 3 & -8 & 1 \end{bmatrix}$$

(i) Compute $A+B$.

(3 marks)

(ii) Find the determinant of AB.

(4 marks)

(b) The **Table Q2** shows the retail price in RM per kg, of three commodities, namely red chilies, long beans, and cucumber, in three shops.

Table Q2: Retail price for three commodities in the three shops

	Red Chilies	**Long Beans**	**Cucumber**
Makro	4	2	2
Tunas	2	2	2
Mart	4	4	2

The shops supply x kg red chilies, y kg long beans, and z kg cucumber to their main customers. The revenue earned by Makro, Tunas and Mart are RM3000, RM2000, and RM3500 respectively.

(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 quantities of red chilies, long beans, and cucumber supplied by the shops to their customers.

(10 marks)

Q3 (a) A chair company produces two models of chairs. The Sequoia model takes 3 worker-hours to assemble and 0.5 worker-hour to paint. The Saratoga model takes 2 worker-hours to assemble and 1 worker-hour to paint. The maximum number of worker-hours available to assemble chairs is 240 per day, and the maximum number of worker-hours available to paint chairs is 80 per day. The company makes a profit of RM200 on each Sequoia model and RM100 on each Saratoga model.

Formulate a linear programming model to maximise the profit.

(4 marks)

(b) Consider the following linear programming model:

Minimise and maximise

$Z = 6x + 2y$

subject to

$$x + 2y \leq 20$$
$$2x + y \leq 16$$
$$x + y \geq 9$$
$$x, y \geq 0$$

(i) Illustrate the linear programming model by sketching a graph.

(4 marks)

(ii) Compute the minimum solution and minimum value.

(4 marks)

(iii) Compute the maximum solution and maximum value.

(8 marks)

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

(i) $f(x)=\dfrac{2}{(3x^3-6)^4}$

(3 marks)

(ii) $f(x)=\ln\left(\sqrt{x}+3\right)$

(3 marks)

(iii) $f(x)=\dfrac{(2x^2-1)(x^2+3)}{(x^2+1)}$

(4 marks)

(b) Let x be the number of cameras that can be sold at a price of RMp per unit and $C(x)$ is the total cost of producing x cameras. The price-demand equation and the total cost function for the production of cameras are $x=6000-20p$ and $C(x)=72000+60x$ respectively.

(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.

(4 marks)

Q5 (a) Calculate the area bound by $f(x)=5-2x-6x^2$ and $y=0$ for $1 \leq x \leq 2$.

(4 marks)

(b) The rate of change of the value of a house that cost RM350,000 to build can be modeled by

$$\frac{dV}{dt}=8e^{0.05t}$$

where t is the time in years since the house was built and V is the value (in thousands of ringgit) of the house.

(i) Identify the value of the house, $V(t)$ after t years.

(7 marks)

(ii) Estimate the value of the house after 20 years.

(3 marks)

(iii) Predict the time period for the value of the house to reach RM700,000.

(6 marks)

-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 logarithml function:

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

Derivative of exponential function:

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

Integration

Basic integration:

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

Definite integral:

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