Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	MATHEMATICS FOR MANAGEMENT
COURSE CODE	:	BPA 12203
PROGRAMME CODE	:	BPA / BPB / BPC / BPP
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWERS **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) Calculate the number ways where three persons sit on two chairs or two persons sit on three chairs.

(4 marks)

(b) An examination paper has two parts, Part A and Part B. There are five questions in Part A and 7 questions in Part B. A candidate is required to answer 3 questions from Part A which must include either Question 1 or Question 2 but not both and any 4 questions from Part B.

Find the number of ways the candidate can answer the questions.

(6 marks)

(c) The following **Table Q1** shows the number of identical blue and orange ball in three bags.

Table Q1: Number of identical blue and orange ball

Bag	**Colour**	
	Blue	**Orange**
P	7	4
Q	5	6
R	2	3

(i) Compute the number of different arrangement if all the balls in bag P arranged in a row.

(3 marks)

(ii) A ball is randomly picked from each bag.

Find the number ways this can be done if all the balls picked are of the same colour.

(4 marks)

(iii) Four balls are randomly picked from bag Q without replacement.

Find the number of ways the balls can be picked if there are equal number of blue and orange balls.

(3 marks)

Q2 (a) The matrices A and B are given by

$$A = \begin{bmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 2 & -9 \\ 1 & b & 6 \\ 1 & c & -6 \end{bmatrix}$$

(i) Show that $\det A = (a-b)(b-c)(c-a)$.

(4 marks)

(ii) Find a, b and c if $A = B$.

(3 marks)

(b) The variables x, y and z satisfy the following system of linear equations:

$$\begin{aligned} -3x + 2y - z &= -7 \\ x + y + z &= 2 \\ 2x + z &= 4 \end{aligned}$$

(i) Write down the matrix equation for the system of linear equations.

(2 marks)

(ii) Find the inverse of the matrix.

(8 marks)

(iii) Find the values for x, y and z.

(3 marks)

Q3 (a) A manufacturing company makes two models of a product namely model A and model B. Each piece of Model A requires 9 labour hours for fabricating and 1 labour hour for finishing. Each piece of Model B requires 12 labour hours for fabricating and 3 labour hours for finishing. For fabricating and finishing, the maximum labour hours available are 180 and 30 respectively. The company makes a profit of RM 8000 on each piece of model A and RM 12000 on each piece of Model B.

Formulate a linear programming model to maximise the profit.

(4 marks)

(b) Consider the following linear programming model:

Minimise and maximise

$Z = 3x + 4y$

subject to

$$y + 4x \geq 8$$
$$y - x > 2$$
$$y \leq 7$$
$$x, y \geq 0$$

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

(4 marks)

(ii) Determine three coordinates of the corner points in **Q3(b)(i)**.

(7 marks)

(iii) Compute the minimum and maximum value.

(5 marks)

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

(i) $f(x) = \ln e^{4x+1}$

(2 marks)

(ii) $f(x) = \dfrac{(8x-1)^5}{(3x-1)^3}$

(4 marks)

(iii) $f(x) = (x^2+1)\ln(2x+1)$

(4 marks)

(b) The demand equation for a product is $p(x) = 2 - 0.001x$. $p(x)$ is the price of the product.

Find the level of production when the revenue RM1000.

(4 marks)

(c) A small tie shop sells ties for RM3.50 each. The daily cost function is estimated to be $C(x)$ ringgit, where x is the number of ties sold on a typical day and

$$C(x) = 0.0006x^3 - 0.03x^2 + 2x + 20.$$

Determine the value of x that will maximize the store's daily profit.

(6 marks)

Q5 (a) Find $\int\left(\frac{x^2+3x-2}{\sqrt{x}}\right)dx$.

(4 marks)

(b) Calculate the area below $f(x)=-x^2+4x+3$ and above $g(x)=-x^3+7x^2-10x+5$ over the interval $1\le x\le 2$.

(6 marks)

(c) Let $P(t)$ denote the population of a community in thousands t years from now. It is estimated that t years from now the population of a certain lakeside community will be changing at the rate of

$$\frac{dP}{dt}=0.6t^2+0.2t+0.5,$$

thousand people per year. Furthermore, environmentalists have found that the level of pollution in the lake increases at the rate of approximately 5 units per 1000 people. Assume that the initial population of the community is 1000 people.

Estimate the pollution rate increment in the lake during the next 2 years.

(10 marks)

-END OF QUESTIONS –

FINAL EXAMINATION

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Combinatorics

Permutation:

$$\frac{n!}{(n-r)!} = {}^{n}P_{r}$$

Combination:

$$\frac{n!}{(n-r)!r!} = {}^{n}C_{r}$$

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:

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