Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017

COURSE NAME	:	MATHEMATICS FOR MANAGEMENT
COURSE CODE	:	BPA 12203
PROGRAMME CODE	:	BPA / BPB / BPC / BPP
EXAMINATION DATE	:	DECEMBER 2016 / JANUARY 2017
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWERS **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) On a history exam, each of six items in one column is to be matched with exactly one of eight items in another column. No item in the second column can be selected more than once.

Compute the number of matching can be done using these two columns.

(2 marks)

(b) A lecture hall has five doors.

(i) Determine the number of ways for a student to enter the hall by one door and exit by a different door.

(2 marks)

(ii) Determine the number of ways for a student to enter the hall by one door and exit by any door.

(2 marks)

(c) When at least one of five flags colored red, green, yellow, blue, and black is arranged vertically on a flagpole, the result indicates a signal. Different arrangement give different signals. Calculate:

(i) The number of possible signals if all five flags are used.

(2 marks)

(ii) The number of possible signals if at least one flag is used.

(12 marks)

Q2 (a) Let

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

(i) Compute AB.

(4 marks)

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

(2 marks)

(b) Hassan came out of the post office after spending RM12.00 on 20 cent, 30 cent and 50 cent stamps. He bought 40 stamps and the amount of 20 cent stamps is equal to the sum of the amount of 30 cent stamps and 50 cent stamps.

(i) Write down the **THREE (3)** linear equations from the above information as a matrix equation in the form of $AX = B$.

(4 marks)

(ii) Find the number of each type of stamps that Hassan has bought by using Gauss-Jordan Elimination method.

(10 marks)

Q3 (a) South Shore Sail Loft manufactures regular and competition sails. Each regular sail takes 2 hours to cut and 4 hours to sew. Each competition sail takes 3 hours to cut and 10 hours to sew. There are 150 hours available in the cutting department and 380 hours available in the sewing department. South Shore Sail makes a profit of RM100 on each regular sail and RM200 on each competition sail.

Formulate a linear programming model to maximize the profit.

(4 marks)

(b) Consider the following linear programming model:

Minimize and maximize

$Z = 4x + 3y$

subject to

$$2x + y \geq 12$$
$$x + y \geq 8$$
$$x \leq 12$$
$$y \leq 12$$
$$x, y \geq 0$$

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

(5 marks)

(ii) Compute the maximum solution and maximum value.

(4 marks)

(iii) Compute the minimum solution and minimum value.

(7 marks)

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

(i) $f(x)=\left(x^3-2x^2+7x-3\right)^4$

(3 marks)

(ii) $f(x)=(x+5)\dfrac{\left(x^2+4\right)}{\left(x^2-1\right)}$

(5 marks)

(iii) $f(x)=x^3\ln x$

(3 marks)

(b) Suppose that the demand equation for a monopolist is $p=100-0.01x$ and the cost function is $C(x)=50x+10,000$.

(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 under the curve $y=9\sqrt{x}-2x$, between $x=1$ and $x=4$.

(4 marks)

(b) A contaminated lake is treated with a bactericide. The rate of increase in harmful bacteria t days after the treatment is given by:

$$\frac{dN}{dt}=-\frac{2,000t}{1+t^2} \qquad 0\le t\le 10$$

where $N(t)$ is the number of bacteria per millilitre of water after t days.

(i) Identify $N(t)$ if the initial count was 5000 bacteria per milliliter.

(7 marks)

(ii) Estimate bacteria count after 10 days.

(3 marks)

(iii) Predict the time period in two decimal places, for the bacteria count to reach 1000 bacteria per milliliter.

(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:

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

Product rule:

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

Quotient rule:

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

Derivative of exponential function:

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

Integration

Basic integration:

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

Definite integral:

$$\int_{a}^{b} f(x)\,dx = \left[F(x)\right]_{a}^{b} = F(b)-F(a)$$