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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2014/2015

COURSE NAME	:	MATHEMATICS FOR MANAGEMENT
COURSE CODE	:	BPA 12203
PROGRAMME	:	1 BPA/1 BPB/1 BPC
EXAMINATION DATE	:	DECEMBER 2014/JANUARY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

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Q1 (a) Compute the number diagonals for a 101 sided polygon.

(5 marks)

(b) Calculate the number of even numbers that are greater than 2000 that can be formed using each of the digits 1, 2, 4 and 6, without repetitions.

(5 marks)

(c) At a restaurant, a complete dinner consists of an appetizer, an entrée, a dessert, and a beverage. The choices for the appetizer are soup and salad; for the entrée, the choices are chicken, fish, steak, and lamb; for the dessert, the choices are cherries jubilee, fresh peach cobbler, chocolate truffle cake, and blueberry roly-poly; for the beverage, the choices are coffee, tea, and milk.

Determine the possible number for complete dinners.

(10 marks)

Q2 (a) Let

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

Compute

(i) A+B

(2 marks)

(ii) AB

(3 marks)

(iii) det(AB)

(3 marks)

(b) Given

$$\begin{aligned} x_1 + 8x_2 + 7x_3 &= 135 \\ 6x_1 + 6x_2 + 8x_3 &= 155 \\ 3x_1 + 4x_2 + 6x_3 &= 75 \end{aligned}$$

(i) Write the system of linear equations above as a matrix equation of the form AX=B.

(2 marks)

(ii) Identify the inverse of A by using row elementary operation method.

(6 marks)

(iii) Solve the system of linear equations by using the inverse matrix method.

(4 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

$$\begin{aligned} 2x + y &\geq 12 \\ x + y &\geq 8 \\ x &\leq 12 \\ y &\leq 12 \\ x, y &\geq 0 \end{aligned}$$

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

(5 marks)

(ii) Compute the maximum solution and maximum value.

(7 marks)

(iii) Compute the minimum solution and minimum value.

(4 marks)

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

(i) $f(x) = (2x - 15)(x^2 + 18)$

(3 marks)

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

(3 marks)

(iii) $f(x) = 3\ln(1 + x^2)$

(3 marks)

(b) The demand for an item produced by Weelux is given by $p+0.2x=100$ where p is the price per unit and x is the quantity demanded. The total cost, $C(x)$ of producing x units of the item is given by $C(x)=800+30x$ where x is the level of output.

(i) Derive the profit function.

(3 marks)

(ii) At a production level of 100 item, predict the marginal profit.

(3 marks)

(iii) Estimate the level of output which will maximise profit.

(3 marks)

(iv) Compute the maximum profit.

(2 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 market research department for an automobile company estimates that sales (in millions of ringgit) of a new electric car will increase at the monthly rate of

$$S'(t)=4e^{-0.08t} \qquad 0\leq t\leq 24$$

t months after the introduction of the car.

(i) Identify the total sales $S(t)$ t months after the car is introduced if we assume that there were 0 sales at the time the car entered the marketplace.

(7 marks)

(ii) Estimate the total sales during the first 12 months after the introduction of the car.

(3 marks)

(iii) Predict the time period for the total sales to reach RM40 million.

(6 marks)

-END OF QUESTION-

FINAL EXAMINATION

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Combinatorics

Permutation:

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

Combination:

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

Matrices

Determinant:

If $A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$,

then $\det(A) = a_{11}a_{22}a_{33} + a_{12}a_{23}a_{31} + a_{13}a_{21}a_{32} - a_{13}a_{22}a_{31} - a_{11}a_{23}a_{32} - a_{12}a_{21}a_{33}$.

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 exponential function:

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

Integration

Basic integration:

$$\int a\,dx = ax + C$$

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

$$\int [f(x) + g(x)]\,dx = \int f(x)\,dx + \int g(x)\,dx$$

$$\int [f(x) - g(x)]\,dx = \int f(x)\,dx - \int g(x)\,dx$$

$$\int c\,f(x)\,dx = c\int f(x)\,dx$$

Integration for exponential functions:

$$\int e^x\,dx = \frac{1}{a}e^x + C$$

$$\int e^{ax}\,dx = \frac{1}{a}e^{ax} + C$$

Definite integral:

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