Universiti Tun Hussein Onn Malaysia

# UNIVERSITI TUN HUSSEIN ONN MALAYSIA

## FINAL EXAMINATION
## SEMESTER I
## SESSION 2013/2014

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|---|---|---|
| COURSE NAME | : | MATHEMATICS FOR REAL ESTATE MANAGEMENT |
| COURSE CODE | : | BPE 15002 / BWM10702 |
| PROGRAMME | : | 1 BPD |
| EXAMINATION DATE | : | DECEMBER 2013/JANUARY 2014 |
| DURATION | : | 2 HOURS |
| INSTRUCTION | : | ANSWER **ALL** QUESTIONS |

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

**Q1** (a) Given the vectors $\mathbf{a} = (1, -1, 2)$, $\mathbf{b} = (-2, 0, 2)$ and $\mathbf{c} = (3, 2, 1)$, evaluate

(i) $(\mathbf{a} + \mathbf{b}) \bullet \mathbf{c}$

(4 marks)

(ii) $\mathbf{a} \times (\mathbf{b} + \mathbf{c})$

(6 marks)

(b) Given the vectors $\mathbf{a} = (2, 1, 0)$, $\mathbf{b} = (2, -1, 1)$ and $\mathbf{c} = (0, 1, 1)$, show that

$$\mathbf{a} \bullet (\mathbf{b} \times \mathbf{c}) = (\mathbf{a} \times \mathbf{b}) \bullet \mathbf{c}$$

(10 marks)

**Q2** (a) A linear programming model is given as follows.

$$\begin{aligned} &\text{Maximize} && P = 5x + 7y \\ &\text{subject to} && \\ & && 2x + 3y \le 60 \\ & && x - 3y \ge 9 \\ & && x, y \ge 0 \end{aligned}$$

Apply the graphical approach to determine feasible region, corner points and optimal solution.

(12 marks)

(b) A factory manufactures two products, each requiring the use of three machines. The first machine can be used at most 70 hours; the second machine can be used at most 40 hours; and the third machine can be used at most 90 hours. The first product requires 2 hours on machine 1, 1 hour on machine 2, and 1 hour on machine 3; the second product requires 1 hour each on machines 1 and 2, and 3 hours on machine 3. The profit is RM40 per unit for the first product and RM60 per unit for the second product.

Let $x$ represent the number of first products and $y$ represent the number of second products. Formulate a linear program model so that the units of each product can be manufactured in order to maximize profit.

(8 marks)

**Q3** (a) An augmented matrix is given as follows:

$$\left[\begin{array}{ccc|ccc} 1 & 1 & -1 & 1 & 0 & 0 \\ 3 & -1 & 0 & 0 & 1 & 0 \\ 2 & -3 & 4 & 0 & 0 & 1 \end{array}\right]$$

Do the appropriate row operations on the augmented matrix above and state the inverse of the matrix.

(12 marks)

(b) Four large cheeseburgers and two chocolates shakes cost a total of RM7.90. Two chocolates shakes cost 15 cents more than one large cheeseburger.

Determine the costs of a large cheeseburger and a chocolates shakes.

(8 marks)

**Q4** (a) A company extracts minerals from ore. The number of kilograms of minerals $A$ and $B$ that can be extracted from each kilogram of ores I and II are given in Table **Q4 (a)**, together with the costs per kilogram of the ores.

Table **Q4 (a)**: Mineral extraction

| | Ore I (kg) | Ore II (kg) |
|---|---|---|
| Mineral $A$ | 80 | 160 |
| Mineral $B$ | 140 | 40 |
| Cost per kg (RM) | 60 | 80 |

The company must produce at least 4 000 kg of mineral $A$ and 2 000 kg of mineral $B$. Let $x$ represent the number of ore I and $y$ represent the number of ore II. Write the corresponding constraints to minimize the cost.

(8 marks)

(b) A linear programming problem is given below.

Maximize $P = 4x_1 + 7x_2$
subject to

$$2x_1 + 3x_2 \leq 9$$
$$x_1 + 5x_2 \leq 10$$
$$x_1, x_2 \geq 0$$

Apply the Simplex method to obtain the optimal solution.

(12 marks)

**Q5** (a) Consider the following matrices.

$$A = \begin{bmatrix} 1 & 2 \\ 0 & 4 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 4 & -2 \end{bmatrix}, \quad C = \begin{bmatrix} 3 & 1 \\ 4 & -1 \\ 0 & 2 \end{bmatrix}, \quad D = \begin{bmatrix} 3 & -1 \\ 4 & 2 \end{bmatrix}.$$

Compute the operation of $2AD + 3BC$.

(8 marks)

(b) A system of linear equations is given below.

$$\begin{aligned} 1x_1 + 2x_2 + 2x_3 &= 3 \\ 2x_1 + 5x_2 + 7x_3 &= 2 \\ 2x_1 + 1x_2 - 4x_3 &= 4 \end{aligned}$$

Solve the system by using Cramer's rule.

(12 marks)

**- END OF QUESTION -**