UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE NAME	:	MATHEMATICS FOR MANAGEMENT
COURSE CODE	:	BSM 1813 / BWM 10803 / BPA 12203
PROGRAMME	:	1 BPA, 1 BPB, 1 BPC
EXAMINATION DATE	:	DECEMBER 2012 / JANUARY 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS.

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

Q1 (a) Consider the following matrices

$$A = \begin{pmatrix} 1 & 7 & 2 \\ 9 & 3 & 8 \\ 4 & 5 & 6 \end{pmatrix} \text{ and } B = \begin{pmatrix} 3 & 1 \\ 2 & 5 \\ 6 & 4 \end{pmatrix}.$$

(i) Identify the dimension of each matrix.
(ii) Determine the multiplication of A and B if necessary.
(ii) Calculate the inverse of matrix A.

(10 marks)

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

$$\begin{aligned} 2x_1 &+ 6x_2 - 8x_3 = 9 \\ 5x_1 &- 1x_2 + 4x_3 = 1 \\ 3x_1 &- 9x_2 + 7x_3 = 6 \end{aligned}$$

(i) Define the transition matrix A and the vector b for the system.
(ii) Solve the system of linear equations by using the Cramer's rule.

(10 marks)

Q2 (a) Consider a linear program problem for producing food with types I and II.

Minimize $C = 1.80x_1 + 2.20x_2$
Subject to
Potassium : $5x_1 + 8x_2 \geq 200$ grams
Carbohydrate : $15x_1 + 6x_2 \geq 240$ grams
Protein : $3x_1 + 12x_2 \geq 180$ grams
$x_1, x_2 \geq 0$

(i) State the decision variables for the problem.
(ii) Solve the problem by using the graphical solution procedure. Use the graph paper in Appendix 1 to indicate your answer.

(10 marks)

(b) The decision variables for the linear program model that shown in Figure Q2 (b) are defined by

x_1 = quantity of products type 1 to produce,

x_2 = quantity of products type 2 to produce.

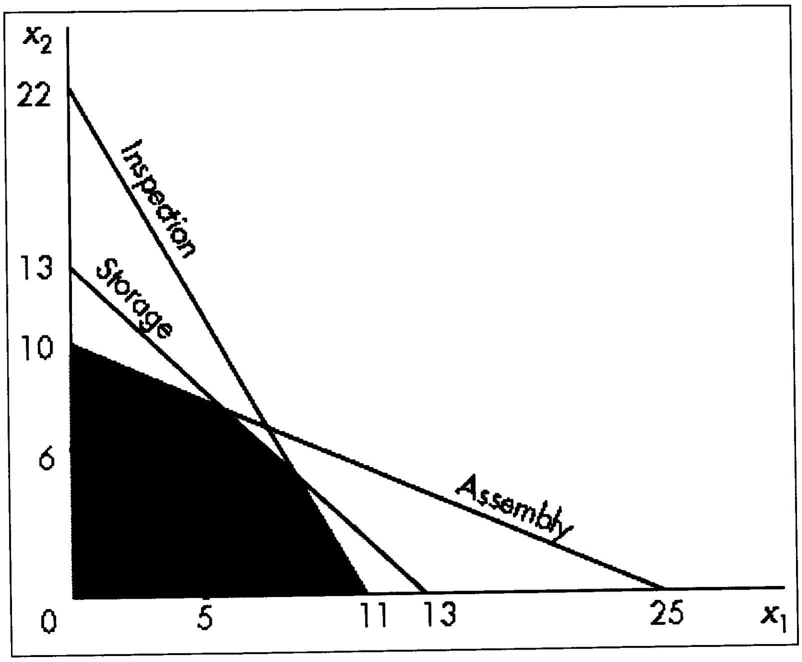


Figure Q2 (b): Graphical linear program model

(i) Write the inequalities for assembly, inspection and storage.

(ii) Formulate the linear programming model.

(10 marks)

Q3 (a) A small candy shop is preparing for the holiday season. The owner must decide how many bags of *deluxe mix* and how many bags of *standard mix* of peanut and raisin to put up. The deluxe mix has 2/3 kg raisins and 1/3 kg peanuts per bag, and the standard mix has 1/2 kg raisins and 1/2 kg peanuts per bag. The shop has 90 kg of raisins and 60 kg of peanuts to work with. Peanuts cost RM0.60 per kg and raisins cost RM1.50 per kg. The deluxe mix will sell for RM2.90 per kg, and the standard mix will sell for RM2.55 per kg. The owner estimates that no more than 110 bags of each type can be sold. In order to maximize the profit, this problem can be formulated as a linear program problem.

(i) Define the decision variables for this problem.

(ii) Prepare a linear program model to assist the owner.

(8 marks)

(b) Consider a linear program model

$$\begin{aligned} \text{Maximize} \quad & P = 4x_1 + 2x_2 + 5x_3 \\ \text{Subject to} \quad & \\ & 1x_1 + 2x_2 + 1x_3 \le 25 \\ & 1x_1 + 4x_2 + 2x_3 \le 40 \\ & 3x_1 + 3x_2 + 1x_3 \le 30 \\ & x_1, x_2, x_3 \ge 0 \end{aligned}$$

(i) Change the constraints to equations by introducing the slack variables.
(ii) Demonstrate the Simplex solution method for the optimal solution. Use the Simplex tableau in Appendix 2 to indicate your answer.
(iii) Judge the value of slack variables.

(12 marks)

Q4 (a) Two functions are given below:

$$f(x) = 10x^3 + 3x^2 + 7x + 5 \text{ and } g(x) = e^{-x} \ln 2x$$

(i) Name each of the functions.
(ii) Find the derivative for each of the functions.
(iii) Evaluate each of the derivatives at $x = 1$.

(10 marks)

(b) An apartment complex has 250 apartments to rent. If they rent x apartments, then their monthly profit, in ringgits, is given by

$$P(x) = -8x^2 + 3\,200x - 80\,000 \text{ for } 0 \le x \le 250.$$

(i) Determine the critical point when $P'(x) = 0$.
(ii) Specify the profits they will generate at $x = 0$, $x = 200$ and $x = 250$.
(iii) Recommend the number of apartments they should rent in order to generate the maximum profit.

(10 marks)

Q5 (a) Consider a general function given below:

$$h(x) = \frac{f'(x)}{f(x)} e^{\ln f(x)}$$

(i) Show that the function $g(x) = e^{\ln f(x)} + c$ is the anti-derivative of $h(x)$, where c is any constant.
(ii) Complete the integration if $f'(x) = 2x + 3$.
(iii) Evaluate the function $g(x)$ from $x = 1$ to $x = 2$.

(10 marks)

(b) An indefinite integral is given below:

$$\int 2x\sqrt{4 + x^2}\ dx$$

(i) Suggest a variable u so that the substitution method is applicable.
(ii) Outline the steps to evaluate the integral in term of u.
(iii) Summarize the final answer in term of x.

(10 marks)

– END OF QUESTIONS –

Appendix 1

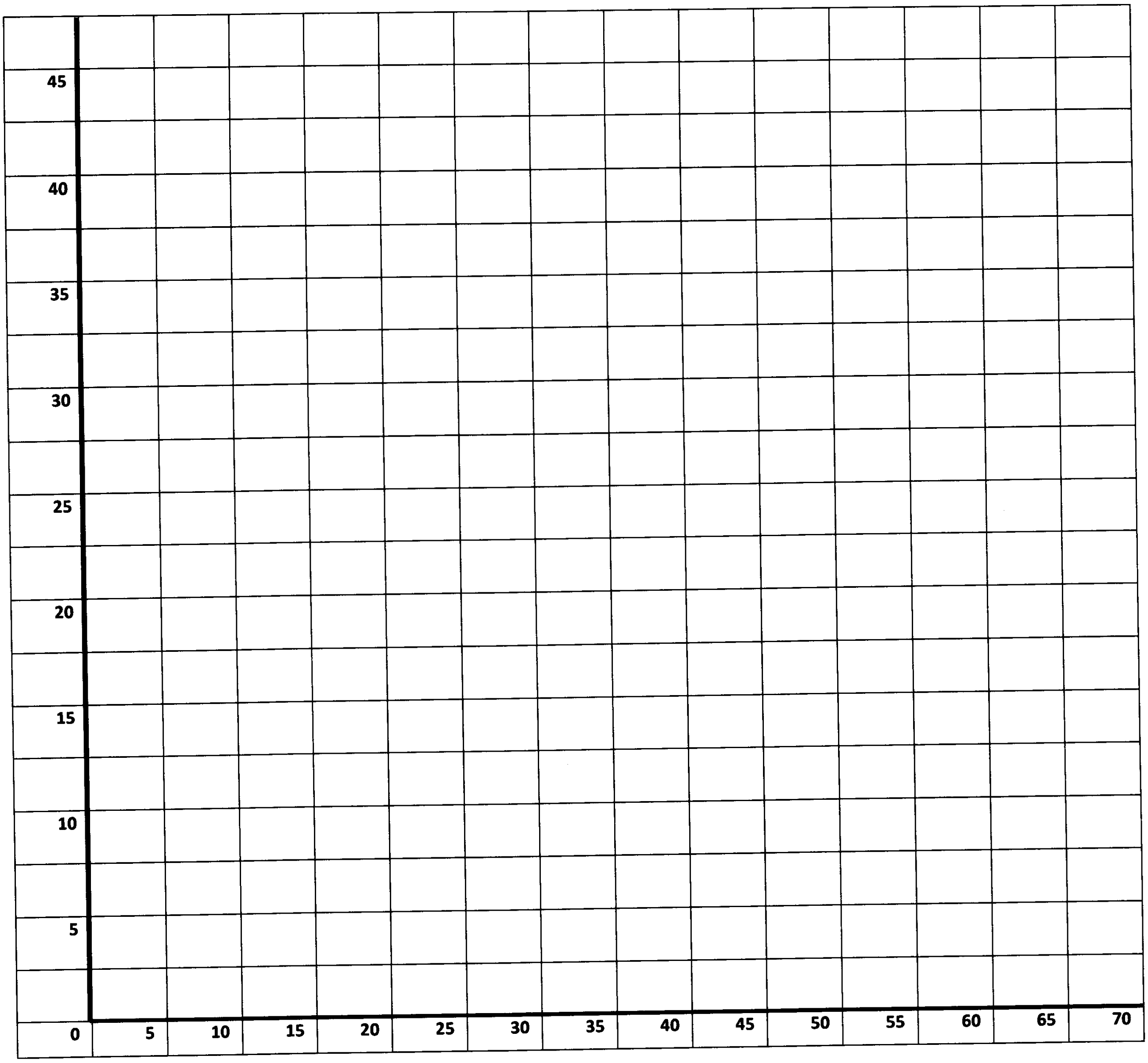
FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2012/2013
COURSE : MATHEMATICS FOR MANAGEMENT

PROGRAMME : 1 BPA, 1 BPB, 1 BPC
COURSE CODE : BPA 12203 / BWM 11003

Name: ______________________________ Matrix No.: ______________

GRAPH PAPER



Appendix 2

FINAL EXAMINATION

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SIMPLEX TABLEAU

	x_1	x_2	x_3	s_1	s_2	s_3	P	RHS
s_1								
s_2								
s_3								
P								

	x_1	x_2	x_3	s_1	s_2	s_3	P	RHS
P								

	x_1	x_2	x_3	s_1	s_2	s_3	P	RHS
P								