



UNIVERSITY OF EMBU

2017/2018 ACADEMIC YEAR

SECOND SEMESTER EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN
FINANCE

BFI 110: MANAGEMENT MATHEMATICS 11

DATE: APRIL 4, 2018

TIME: 2:00 PM - 4:00 PM

INSTRUCTIONS:

1. Answer **QUESTION ONE** and any other **TWO QUESTIONS**.
2. Show clearly your work and the number of questions attempted.

QUESTION ONE (30 MARKS)

- a) A firm selling directories has developed profit function as follows

$$p = 9D - 0.005D^2 + 0.06DA - 80A^2 - 5000$$

where D = No of directories sold and

A = No of advertising pages

Required: How many directories containing how many pages should be sold to maximize profit. (5 marks)

- b) A baker makes two products; large loaves and small round loaves. He can sell up to 280 of the large loaves and up to 400 small round loaves per day. Each large loaf occupies 0.01m^3 of shelf space, each small loaf occupies 0.008m^3 of space, and there is 4m^3 of shelf space available. There are 8 hours available each night for baking, and he can produce large loaves at the rate of 40 per hour, and small loaves at the rate of 80 per hour. The profit on each large loaf is Sh.5.00 and Sh.3.00 profit on the small round loaf.



Required:

- i) Formulate the Linear programming model. (5 marks)
- ii) In order to maximize profits, how many large and small round loaves should he produce using graphical method? (7 marks)
- iii) Determine the maximum profit using simplex method (4 marks)

- c) given that $A = \begin{pmatrix} 3 & -1 \\ 4 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} 1/2 & 0 \\ 1 & 2 \end{pmatrix}$
- i) find AB and BA state the property of matrix multiplication which is illustrated by the answer (5 marks)
- ii) Find A+B and A-B (4 marks)

QUESTION TWO (20 MARKS)

- a) With the help of an example, briefly describe the following types of matrices:
- i) Identity matrix (3 marks)
- ii) Square matrix (3 marks)
- iii) Null matrix (3 marks)
- iv) Transpose matrix (3 marks)
- b) Solve for x, and y in the below system of equations using the matrix method (8 marks)

$$2x+y-z = 11$$

$$x-2y+2z = -2$$

$$3x-y+3z = 5$$

QUESTION THREE (20 MARKS)

A firm manufactures three products: tables, chairs and stools. Each product passes through two departments, manufacturing and finishing. The table below shows the resource utilization, resource availability and profit in respect of each product.

Product	Resources			Profit per unit (\$)
	Timber (cubic feet)	Manufacturing department (hrs.)	Finishing department (hrs.)	
Table	10	7	2	12
Chair	2	3	4	3
Stool	1	2	1	1
Availability	100	77	80	

Required:

- Formulate the linear programming problem from the above situation (5 marks)
- Use Simplex method to find the optimal production in units of each product that maximizes the firm's profitability (13 marks)
- Determine the maximum profit for the firm (2 marks)

QUESTION FOUR (20 MARKS)

- The cost function is $c=q^2-30q+200$ where q = quantity produced. Find the point of minimum cost. (4 marks)
- Solve the following equations using matrices (4 marks)

$$3x+2y=4$$

$$5x-2y=8$$
- Find the stationary points on the curve $y = x^5 - 5x^4 + 5x^3 - 1$ and determine the nature of each. (12 marks)

QUESTION FIVE (20 MARKS)

- Explain three assumptions of linear programming (6 marks)
- Use simplex method to solve for x_1 , x_2 and x_3 in the below linear programming problem (14 marks)

Minimize

$$C = 100x_1 + 80x_2 + 10x_3$$

Subject to:

$$100x_1 + 7x_2 + x_3 \geq 30$$

$$120x_1 + 10x_2 + x_3 \geq 40$$

$$70x_1 + 8x_2 + x_3 \geq 20$$

$$x_1, x_2, x_3 \geq 0$$

--END--

