



*(University of Choice)*

# **MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)**

**UNIVERSITY MAIN EXAMINATIONS**

**2022/2023 ACADEMIC YEAR**

**SECOND YEAR SECOND SEMESTER EXAMINATIONS**

**FOR THE DEGREE  
OF  
BACHELOR OF COMMERCE**

**COURSE CODE:    BCB 206**

**COURSE TITLE:    MANAGEMENT DECISION MODELS**

**DATE: TUESDAY, 18<sup>TH</sup> APRIL 2023    TIME: 12:00 - 2:00PM**

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## **INSTRUCTIONS TO CANDIDATES**


*Answer question **ONE** and any other **TWO** questions*

**TIME: 2 HOURS**

MMUST observes ZERO tolerance to examination cheating

**QUESTION ONE (COMPULSORY) (30 MARKS)**

This Paper Consists of 4 Printed Pages. Please Turn Over.



a) It is said that management is equivalent to decision making. Do you agree? Explain. (5marks)

b) A multinational company has two factories that ship to three regional warehouses. The cost of transportation per unit in thousands of Kenya shillings are:

Warehouse	Transportation costs (Kshs '000')	
	F1	F2
W1	2	4
W2	2	2
W3	5	3

Factory F2 is old and has a variable manufacturing cost of Kshs 20 per unit. Factory F1 is modern and produces for Kshs 10 per unit. Factory F2 has a monthly capacity of 250 units and factory F1 has a monthly capacity of 400 units. The requirements at the warehouse are: W1= 200units, W2 =100 units and W3 =250 units. How should each factory ship to each warehouse in order to minimize the total cost? Formulate this problem as a linear programming model. Do not solve it. (5 marks)

c) To stimulate interest and provide an atmosphere for intellectual discussion, the Accounting and finance department in SOBE decides to hold special seminars on four contemporary topics: Taxation, Portfolio Management, Private Mutual Funds, Swaps and Options. Such seminars would be held once per week in the afternoons. However, scheduling these seminars (one for each topic and not more than one seminar per afternoon) has to be done carefully so that the number of students unable to attend is kept to a minimum. Careful study indicates that the number of students who cannot attend a particular seminar on a specific day is as follows

Day	Taxation	Portfolio Management	Private Mutual Funds	Swaps and Options
Monday	50	40	60	20
Tuesday	40	30	40	30
Wednesday	60	20	30	20
Thursday	30	30	20	30
Friday	10	20	10	30

Find an optimal schedule of the seminars. Also find out the total number of students who will be missing at least one seminar. (10 marks)

d) A company has factories at F1, F2 and F3 that supply products to warehouse W1, W2 and W3. The weekly capacities of the factories are 200, 160 and 90 units respectively. The weekly warehouse requirements are 180, 120 and 150 units respectively. The unit shipping costs in Ksh are as follows:

	W1	W2	W3	Supply
F1	16	20	12	200
F2	14	8	18	160
F3	26	24	16	90
Demand	180	120	150	450

Determine the optimal distribution for this company in order to minimize its total shipping cost. (10 marks)

### QUESTION TWO (20 MARKS)

- a) What is a queuing problem, what are the basic characteristics of a queuing system? (5marks)
- b) A firm produces four products. There are four operators who are capable of producing any of these four products. The firm records 8 hours a day and allow 30 minutes for lunch. The processing time in minutes and the profit for each of the products are given below.

Operator	Products			
	A	B	C	D
1	15	9	10	6
2	10	6	9	6
3	25	15	15	9
4	15	9	10	10
<b>Profit (\$) per unit</b>	8	6	5	4

Find the optimal assignment of products to operators. (10 marks)

- c) State the assumptions made in solving a linear programming problem. (5 marks)

### QUESTION THREE (20 MARKS)

- a) What are the major limitations of game theory? (5 marks)
- b) Use simplex method to solve the following linear programming problem model

$$\text{Maximize: } Z = 3x_1 + 5x_2 + 4x_3$$

$$\text{Subject to: } 4x_1 + 5x_2 \leq 10$$

$$3x_2 + 4x_3 \leq 12$$

$$5x_1 + 3x_2 + 6x_3 \leq 18$$

$$(x_1, x_2, x_3) \geq 0 \quad (15 \text{ marks})$$

### QUESTION FOUR (20 MARKS)

- a) A stockiest of a particular commodity makes a profit of Kshs 30 on each sale made within the same week of purchase, otherwise he incurs a loss of Kshs 30 on each item. The data on the past sales are given here.

Number of items sold within the same week	5	6	7	8	9	10	11
Frequency	0	9	12	24	9	6	0

- i) Find out the optimum number of items the stockiest should buy every week in order to maximize the profit. (8 marks)
- ii) Calculate the expected value of perfect information. (2 marks)

b) A company manufactures 30 units per day. The sale of these items depends upon demand which has the following distribution

Sales Units	27	28	29	30	31	32
Probability	0.10	0.15	0.20	0.35	0.15	0.05

The production cost and sale price of each unit are Ksh 400 and Kshs 500 respectively. Any unsold product is to be disposed off at a loss of Kshs 150 per unit. There is a penalty of Kshs 50 per unit if the demand is not met. Using the following random numbers estimate the total profit/loss for the company for the next ten days. If the company decides to produce 29 units per day, what is the advantage or disadvantage of the company? (10 marks)

10	99	65	99	95	01	79	11	16	20
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**QUESTION FIVE (20 MARKS)**

The table given illustrates the details of a project model showing activities, time and cost per activity in normal and crash time.

Activity	Normal time(Days)	Crash time (days)	Normal cost Ksh.	crash cost Ksh.
1-2	6	4	600	1000
1-3	4	2	600	1400
2-4	5	3	500	1500
2-5	3	1	450	650
3-4	6	4	900	2000
4-6	8	4	800	3000
5-6	4	2	400	1000
6-7	3	2	450	800

**Required:**

- i) Draw the project network diagram and determine the critical path (6 marks)
- ii) Find the cost of completing the project in normal time (4 marks)
- iii) Crash the project activities two times and determine the minimum cost of completing the project at thesecond crashing. (10 marks)