



# MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF BUSINESS ADMINISTRATION

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF COMMERCE

BMS 102: MANAGEMENT MATHS II

DATE: 14/12/2020

TIME: 8:30- 10:30 AM

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## INSTRUCTIONS:

Answer Question One and Any Other Two Questions.

### QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Write short notes on “The input-output analysis” with reference to both closed and open input-output models. Support your answer with examples. (3 marks)
- b) A radio advertising campaign is conducted over the Christmas season to promote a well-known brand X women cream. For each of several weeks a survey was made. It is found that each week 80% of those using brand X continue to use it and the rest switch to another brand Y. It is found that 10% of those using another brand Y switch to brand X. It is known that the market share for brand X is 70% and that of Y is 30% initially.

#### Required:

- i) The initial market share vector. (1 mark)
- ii) The market shares after advertising each of the first, the second week of advertising campaigns. (3 marks)
- iii) The steady state (long-run) market shares. (3 marks)

- c) i) Discuss the components of a linear programming problem. (3 marks)
- ii) A firm produces two products (type A and type B) using two machines (i and ii). One unit of A can be made in machine 1 for 3 hours and in machine ii for 1 hour. The time available for machine 1 is 12 hours per day while that of machine 11 is 8 hours per day. The profit per unit of product A is Ksh 600 while that from B is Ksh 800. Let X and Y be the number of units produced of A and b made respectively.
- i) Formulate the mathematical model for this problem. (2 marks)
- ii) Graphically solve this LP and find the optimal solution that maximizes the daily profit. What is the maximum profit. (4 marks)
- d) The table below illustrates the 12 possible payoffs in the record and tape companies.

		Decision maker's alternative		
		Expand	Build	Sub contract
State of nature (demand)	High	500,000	700,000	300,000
	Moderate	250,000	300,000	150,000
	Low	250,000	400,000	10,000
	Failure	450,000	800,000	100,000

Identify the optimal decision using;

- i) Maximax criterion. (2 marks)
- ii) Maximin criterion. (2 marks)
- iii) Minimax regret criterion. (2 marks)
- iv) The criterion of realism (Hurwicz's rule) using  $X=0.7$  (2 marks)
- e) Using crammers rule method solve the following equations. (4 marks)

$$x + 2y + 3z = 210$$

$$2x + 3y + 2z = 280$$

$$3x + 3y + 4z = 350$$

### QUESTION TWO (20 MARKS)

- a) Enumerate four reasons for holding inventory besides its being an expensive activity. (6 marks)
- b) ABC departmental store sells 25,000 type A shirts a year. The supplier offers a generous quantity discount. The price list is given below:-

Quantity	Price per shirt (&)
0-999	2.50
1000-1,749	2.00
1750-2,499	1.50
Over 2,500	1.00

- Given that order cost is \*\*\*\*\*20. Inventory carrying cost is 20% of the value of the item. Determine the best inventory policy for ABC. (10 marks)
- c) Explain the difference in the following terminologies used in management.
- i. Pay off table and regret table. (2 marks)
  - ii. A steady state and stochastic process. (2 marks)

### QUESTION THREE. (20MARKS)

- a) Highlight the assumptions of Markov analysis. (4 marks)
- b) The table below shows the intersectoral production and consumption of outputs from an economy's three sectors as well as the external demand requirements.

FROM	TO			
	P	Q	R	Eternal demand
P	150	120	160	200
Q	260	460	280	120
R	160	100	200	100

- Suppose the demand for P increased by 20% and that of Q decreased by 10% while that of R remained constant. Determine the total output from each sector to satisfy the changed demand. (10 marks)
- c) Briefly explain the advantages of linear programming. (6 marks)

### QUESTION FOUR (20 MARKS)

- a) Using relevant examples, explain the meaning of the following types of matrices.
- i) Diagonal matrix (2 marks)
  - ii) Identity matrix (2 marks)
  - iii) Scalar matrix (2 marks)

- b) Discuss two components of the input-output model. (4 marks)
- c) ABC company is considering two alternatives policies for promoting its products.
- 1) Promote brand A only. This will cost Ksh. 150,000 invested in a lumpsum and is expected to change the transition matrix to:

FROM	TO		
	A	B	C
A	0.6	0.2	0.2
B	0.4	0.4	0.2
C	0.6	0.1	0.3

- 2) Promote brand B only. This will cost Ksh. 280,000 invested in a lumpson and is expected to change the transition matrix to:

FROM	TO		
	A	B	C
A	0.1	0.5	0.4
B	0.2	0.8	0
C	0.3	0.5	0.2

**Required:**

Which policy will bring larger increases in ABC's total share of the market in the long run?  
(10 marks)

**QUESTION FIVE (20 MARKS)**

- a) Describe the four types of costs associated with inventory holding highlighting their components. (8 marks)
- b) If the probability that a student A will fail a Maths exams is 0.3 and the probability that student B will fail the same exam is 0.15 and that the probability that both student A and B will fail the Maths exams is 0.08. what is the probability that  
Neither student A nor student B will fail the exam. (3 marks)
- c) Highlight the steps used in the following linear programming solution methods:
- i) Graphical solution. (3 marks)
- ii) Simplex solution method. (3 marks)