



# MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF BUSINESS ADMINISTRATION

FIRST YEAR SPECIAL/ SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF COMMERCE

BMS 102: MANAGEMENT MATHS II

DATE: 29/3/2021

TIME: 8.30-10.30 AM

---

## INSTRUCTIONS:

Answer Question ONE and any other TWO Questions.

### QUESTION ONE (30 Marks)

- a) Briefly explain five reasons why an inventory must be carried out by firms (5 marks)
- b) An inventory situation over a period of 10 weeks was as follows  
Beginning of period: No initial inventory  
First two weeks: Goods supplied at continuous rate of 500 per week. No withdrawals  
Next four weeks: Goods withdrawn at constant rate of 250 per weeks No input  
Next four weeks: Goods required at the constant rate of 200 per week and also goods supplied to store continuously at 300 per week

### Required

- i. Sketch the inventory graph for the 10 week period (3marks)
- ii. Determine the amount in the store at the end of the period (3marks)
- iii. Calculate the inventory level for the 10week period (4marks)
- c) A production line can be set up to produce either product x or product y. The following table gives the breakdown for each product

product	Labour(minutes)	Materials(lbs)	Testing minutes
x	30	2	3
y	15	4	4

In any one week only 30 hours of labour and 280lbs of material is available, and owing to cost and availability the testing equipment must be used for at least 4 hours. Also because of existing orders at least 20x products must be produced. The contribution from each unit of x produced is 12 and each unit of y, is 9

### Required

- Formulate the linear programming problem (5 marks)
- The weekly production that minimizes contribution and calculate this resulting contribution (4 marks)
- The percentage utilization of the available labour for both minimum and maximum contribution (2 marks)
- Solve the following simultaneous equation using the crammer's rule

$$2x+2y+2t=6$$

$$X+2y+3t=8$$

$$4x+y+t=4$$

(4 marks)

### QUESTION TWO (20 MARKS)

- State five assumptions underlying linear programming (5 marks)
- 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)
- 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:

- 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)
- d) Identify three advantages and two disadvantages of linear programming (5 marks)

**QUESTION THREE (20 MARKS)**

- a) i) Identify two applications of matrices in business management (4 marks)
- b) Explain the meaning of the following terms
  - a) Transition matrix (2 marks)
  - b) Event (1 mark)
  - c) Theoretical probability (2 marks)
  - d) Empirical probability (2 marks)
  - e) Conditional probability (2 marks)
- iii) Differentiate between mutually exclusive events and independent events (2 marks)
- c) Explain the mean of term game theory; stating four of its rules (5 marks)

**QUESTION FOUR (20MARKS)**

- a) Identify four types of decision making (4 marks)
- b) 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)
- c) 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. (2marks)
- ii. Maximin criterion. (2marks)
- iii. Minimax regret criterion. (2marks)
- iv. The criterion of realism (Hurwicz's rule) using  $X=0.7$  (2 marks)

**QUESTION FIVE (20MARKS)**

- a) A survey was carried out in 3 districts as at 1<sup>st</sup> jan 2004 and 31<sup>st</sup> dec 2004. The following information was obtained regarding the movement of persons between the districts to 1/01/2014

	TO	A	B	C	1/01/2014
From A		500	200	300	1000
B		400	1400	200	2000
C		1000	2000	1000	4000
		1900	3600	1500	

**Required:**

- i. Obtain the transaction matrix (5 marks)
  - ii. Forecast the number of persons in the respective districts as at 31<sup>st</sup> dec 2006 (5 marks)
  - iii. Obtain the steady state (5 marks)
- b) Identify five components of a input-output table (5 marks)