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 MATHEMATICS II

DATE: 11/8/2021 **TIME: 11:00 – 1:00 PM**

INSTRUCTIONS: Answer Question **ONE** and any other **TWO** Questions.

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Define the following:

(i) A steady state (2 marks)

(ii) Stochastic process. (2 marks)

(ii) Mutually exclusive events (2 marks)

b) Identify five components of a input-output table (2 marks)

c) Outline the assumptions of the EOQ model (5 marks)

d) An economy consists of three industries X, Y and Z and each produces one product. The interaction of the use of X, Y and Z production over some fixed period of time is as shown below:

	X	Y	Z	Final demand	Total production
X	100	40	80	140	360
Y	40	60	40	180	320
Z	60	40	40	100	240

Suppose demand is expected to increase by 30% for X and Y and reduce by the same percentage for Z industries. What must the total output be to meet this projected demand? (6 marks)

e) Highlight the assumptions of Markov analysis (5 marks)

f) The demand for a given item is constant remaining at 200 units annually. The unit cost is Ksh.80 while the per order cost is Ksh.40 and the carrying cost Ksh.10 per unit per annum.

Determine:-

a) The EOQ (2 marks)
b) The optimal Number of orders. (2 marks)
c) The cost associated with the optimal Order Quantity. (2 marks)

QUESTION TWO (20 MARKS)

a) Explain four reasons for holding stock despite it being an expensive affair (8 marks)

b) ABC departmental store sells 25,000 type A shirts a year. The supplier offers a generousquantity discount. The price list is given below: -

Quantity	Price per shirt ($)
0-999	2.50
1,000- 1749	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. (12 marks)

QUESTION THREE (20 MARKS)

a) State four assumptions of input-output model. (4 marks)

b) A continental corporation operates a large fleet of cars for which an extensive preventive maintenance program is utilized. The cars can be classified in one of the three states: Good (G), Fair (F) and Poor (P). The transition matrix of these cars is as follows

	G	F	P
G	0.6	0.3	0.1
F	0.2	0.6	0.2
P	0.1	0.4	0.5

Assume that there are 100 cars in good shape, 60 in fair shape and 20 in poor shape.

(i) How many cars will be found in each condition next week? (2 marks)

(ii) How many cars will be found in each condition once the process stabilizes? (4 marks)

c) The table below illustrates the 12 possible payoffs in the record and tapecompanies.

Table 1:

		Decision Maker's Alternatives		
		Expand	Build	Subcontract
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 (3 marks)

(iv) The Criterion of Realism (Hurwicz's rule) using *a* -0.7 (3 marks)

QUESTION FOUR (20 MARKS)

a) Briefly explain the advantages of linear programming (5 marks)

b) A firm makes two products X and Y and has a total production capacity of nine tonnes per day. X and Y requiring the same production capacity. The firm has a permanent contract to supply at least two tonnes of X and at least three tonnes of Y per day to another company. Each tonne of X requires twenty machine hours production time and each tonne of Y requires fifty machine hours production time. The daily maximum possible number of machine hours is three hundred and sixty. The entire firm's output can be sold and the profit made is Sh. 80 per tonne of X and Sh. 120 per tonne of Y.

(i) Formulate the above as a linear programming problem. (5 marks)

(ii) Using the graphical method, determine the number of tonnes of X and Y that thecompany should produce, hence the maximum profit. (10 marks)

c) Solve the following simultaneous equation using the crammer's rule (5marks)

$$2x+2y+2t=6$$
$$X+2y+3t=8$$
$$4x+y+t=4$$

QUESTION FIVE (20 MARKS)

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 (3 marks)

ii) Identity matrix (3 marks)

iii) Scalar matrix (3 marks)

iv) Square matrix (3 marks)

c) State four reasons of holding inventory besides being an expensive affair (4 marks)