

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF
COMMERCE

BCOM 162: BUSINESS MATHEMATICS II

STREAMS: BCOM Y1S2 ODEL

TIME: 2 HOURS

DAY/DATE: THURSDAY 8/08/2019

8.30 A.M - 10.30 A.M.

INSTRUCTIONS:

- Answer Question ONE and any other TWO questions.
- Do not write anything on the question paper

QUESTION ONE

- (a) Explain the meaning of the following terms as used in probability:
- | | |
|--------------------------|-----------|
| (i) Event | [2 Marks] |
| (ii) Sample space | [2 Marks] |
| (iii) Independent events | [2 Marks] |
| (iv) Sure events | [2 Marks] |
| (v) Dependent events | [2 Mark] |
- (b) Give two application of calculus in business. [2 Marks]
- (c) Assume that $y = 0.5x^2 - 8x + 60$, where y = cost of item in Kshs. '000' of manufacturing x (00) items for some process.

Required:

- (i) Determine the turning points. [4 Marks]
- (ii) Determine the number of items that must be manufactured in order to minimize costs. [3 Marks]

BCOM 162

- (d) A firm is considering production of either product A, B and C. The likely demands for the products are considered as states of nature. The pay offs associated with the product are given in the table below.

Demand	Strategies		
	A	B	C
High	700	500	300
Moderate	300	450	300
Low	150	0	300

Required:

- (i) Use the pay-off table to determine the best production strategy using the palace criteria. [3 Marks]
- (ii) Suppose the states of nature are believed to occur with probabilities 0.3, 0.5 and 0.2 for low, medium and high respectively, which products should the firm produce? [2 Marks]

- (e) A radio manufacturer can sell all the radios of a particular type that he can product. The total cost (Kshs.) in production of radios per week is given by $300q + 2000$. The demand function (Kshs.) is estimated by $500 - 2q$.

Required:

- (i) Derive the revenue function. [2 Marks]
- (ii) Obtain the total profit function. [2 Marks]
- (iii) How many units per week should be produced in order to maximize profit? [2 Marks]

QUESTION TWO

- (a) Explain the meaning of decision theory and explain three decision making methods. [6 Marks]
- (b) Explain four elements of decision. [4 Marks]
- (c) An electric manufacturer has two lines A and B assembling identical electronic units. 5% of the units assembled on line A and 1% of those assembled on line B are defective. All defective units must be reworked at significant increase in cost. During the last eight-hour shift, line A produced 200 units while line B produced 300 units. One unit is selected at random from the 500 units produced.

Required:

- (i) If it is found to be defective, find the probability that it was assembled on line A. [3 Marks]
- (ii) Find the probability that the unit is defective given that it was assembled on line B. [3 Marks]
- (d) Discuss the types of decision making environments. [4 Marks]

QUESTION THREE

(a) In an orderly manner, explain the steps involved in decision making process. [8 Marks]

(b) A certain economy consists of three industries namely Agriculture, Manufacturing and Services. The following is the Leontief Increase Matrix $(1 - A)^{-1}$ for the economy.

$$\begin{pmatrix} 1.7203 & 0.1006 & 0.0678 \\ 0.2245 & 1.6768 & 0.2250 \\ 0.3073 & 0.3449 & 1.2291 \end{pmatrix}$$

The final demand D (in Tonnes for the industries in year 2014 were as follows;

Agriculture	39.24
Manufacturing	60.02
Services	130.65

Determine the gross production X in tonnes for each industry in 2019. [6 Marks]

(c) Explain the meaning of the following decision theory terms;

- (i) States of nature [2 Marks]
- (ii) Equally likelihood criterion [2 Marks]
- (iii) Decision under uncertainty [2 Marks]

QUESTION FOUR

(a) A company provides three products X, Y and Z using raw materials A, B and C. One unit of X requires 1, 2 and 3 units of A, B and C respectively. One unit of Y requires 2, 3 and 2 units of A, B and C respectively. The number of units available for raw material A, B and C are 8, 14 and 13 units respectively. Using the matrix method, find how many units of each product to produce in order to utilize completely the available resources. [6 Marks]

(b) Given function $y = 120x - x^2 + 0.02x^3$, determine the turning point of this curve. [4 Marks]

(c) ABC Ltd is considering whether to enter a very competitive market for manufacturing of Unga products. In case it decides to enter this market, it must either install a new technology equipment or pay overtime wages to the entire staff. In either case, market entry could result in:

- (i) High sales
- (ii) Medium sales
- (iii) Low sales
- (iv) No sales

The management of ABC has estimated that if they enter the market, there is a 60% chance of their shareholders approving the installation of the new equipment. A random analysis of the current market structure reveals that ABC has a 40% chance of achieving high sales, a

BCOM 162

30% chance of achieving medium sales, a 20% chance of achieving low sales and a 10% chance of achieving no sales.

Financial report of ABC indicates that a high level of sales will yield Kshs.1,000,000 profits, medium level of sales will result in a Kshs.600,000 profit, a low level of sales will result in Kshs.200,000 profit and no sale level will cost ABC loss of Kshs.500,000.

Entering the market will require a cash outlay of either Kshs.300,000 to purchase and install the new equipment of Kshs.100,000 for overtime expenses, should the second option be selected. A decision not to enter the market will add zero extra profit to the firm which is currently Kshs.250,000. Assume that all costs and revenues have been discounted to their present values.

Required:

(a) Construct a decision tree for the problem showing clearly the courses of action. [6 Marks]

(b) By applying an appropriate decision tree, recommend whether or not ABC should enter the market. [4 Marks]

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