

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

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

BCOM 161: BUSINESS MATHEMATICS I

STREAMS: BCOM Y1S1

TIME: 2 HOURS

DAY/DATE: THURSDAY 08/07/2021

11.30 A.M – 1.30 P.M

INSTRUCTIONS:

Answer question ONE and any other two questions

Do not write on the question paper

QUESTION ONE (30 MARKS)

(a) Define the following terms as used in business mathematics.

- (i) Universal set [2 marks]
- (ii) Infinite set [2 marks]
- (iii) Disjoint sets [2 marks]

(b) The weekly demand function of passion fruits (sold in cartons) in sokomoko market is modeled as $p = 500 - 2x$. The farmers of the passion fruits have also analyzed the cost of producing a carton of the fruits in the market as $AC = 2x + 100 + \frac{3600}{x}$; where x is the number of cartons of passion fruits produced and sold.

Required:

- (i) The total revenue function [2 marks]
- (ii) What would be the total fixed cost of producing the fruits? [2 marks]
- (iii) Determine the production level at which a farmer will breakeven. [4 marks]

- (iv) What would be the price per unit at the break-even production level. [2 marks]
- (c) Zora deposited ksh 75,000 in a fixed deposit account as a compound interest of 20 % per annum compounded quarterly. Determine the:
- (i) Accumulated amount to the nearest thousands after 4 years. [3 marks]
- (ii) The time it will take for the amount to triple. [4 marks]
- (d) Masauti ltd is an upcoming company situated at kelele Mingi market. During its first month of operation the firm made a loss of ksh 2000 but its profitability has been increasing by ksh 400 in each of the succeeding months.

Required:

- (i) Determine its profitability in its 12th month of operations. [3 marks]
- (ii) If the firm had an initial capital base of ksh 13,000 what would be its total capital base after 12 months of operation. [4 marks]

QUESTION TWO

- (a) The relationship between total cost output in XYZ ltd was found to be linear. It would cost ksh 5,350 to produce 2,000 units and ksh 6,100 to produce 2,500 units in a week. What are the variable costs and fixed weekly costs of production? [5 marks]
- (b) A man deposited ksh 550,000 in two different bank accounts. Part of the money was deposited in an account offering a compound interest of 10% per annum and the remaining amount in an account offering a simple interest of 15% per annum. His total savings after 4 years was ksh 852,820. Calculate the amount deposited in each account. [6 marks]
- (c) Given that P,Q and R are subsets of the universal set $U = \{X: x \text{ is an integer less than } 9 \text{ but greater than } 1\}$ and that $P = \{2,4,6,7\}$ $Q = \{2,3,5,8\}$ and $R = \{3,4,5,6,8\}$. Determine the composition of the following sets;
- (i) $Q^c \cap R$ [2 marks]
- (ii) $P \cap Q \cap R$ [2 marks]
- (iii) $n\{P \cup Q \cup R\}$ [3 marks]
- (iv) $Q - P$ [2 marks]

QUESTION THREE

- (a) Wakili intends to have ksh 8,500,000 at the end of the 10th year. To accumulate this sum he decides to save in a bank a certain amount at the end of the year for the next 10 years. If the bank pays 10 per cent per annum interest, how much should he save each year?

[4

marks]

- (b) Wapishi enterprises is a distributor of three types of gas cylinders: K- gas (K), mid gas (M) and Total –gas (T). Due to its limited capital base and the need to optimize the use of its limited resources, the trader carried out a market survey to determine customers' preference on the three types of cylinders. The market survey involved a sample of 295 households in Kipekele market and following results were obtained from the obtained are not in any way a reflection of the current market for the gas cylinders).

144 households prefer the K-gas

54 household prefer the Mid-gas

78 households prefer the total –gas

24 households prefer the K-gas and the Total –gas

9 households prefer the K-gas and the Mid-gas

72 households prefer none of the three magazines

Required: Clearly showing your workings;

- (i) Present this information on a venn diagram [3 marks]
- (ii) Determine the number of households whose preference was on all the three gas cylinder types. [3 marks]
- (iii) How many households prefer exactly one type of gas cylinder. [2 marks]
- (iv) How many households prefer Mid-gas but not K-gas. [2 marks]
- (c) Use the binomial theorem to find the first three terms in ascending powers of x of

$$\left(2 - \frac{x}{4}\right)^5. \text{ Hence use your expansion to estimate the value of } (1.88)^5. [6 \text{ marks}]$$

QUESTION FOUR

(a) Mahakama wishes to borrow a certain amount of loan from Mashtaka Bank at the prevailing market interest rate of 10% per annum on reducing balance method. Based on his payslip, he has revealed to his banker that he intends to be paying annual instalments of ksh 105,518.90 towards settlement of the loan whose repayment period should be 5 years. Determine;

- (i) The amount of loan a client can borrow now (to the nearest thousands) [3 marks]
- (ii) Prepare the respective loan amortization schedule that would guide Mahakama in loan repayment. [5 marks]

(b) The number of item produced each day by an assembly line worker, x days after an initial training period is modeled by:

$$Y = 120 80e^{-0.03x} \text{ where } y = \text{number of items completed per day and}$$

$X = \text{number of days after the initial training of a worker.}$

Required:

- (i) The number of units produced by an assembly line worker per day, 10 days after training. [2 marks]
- (ii) After how many days will the production be 90 units. [4 marks]
- (c) A dispute tribunal of 8 member is to be constituted from among 10 village elders, 5 religious leaders and the chief. In how many ways can be tribunal be formed such that:
 - (i) No restriction on who is to be included among the 16 member. [2 marks]
 - (ii) The chief must be included. [2 marks]
 - (iii) At least two religious leaders and the chief must be members of the tribunal. [2 marks]