CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF AGRIBUSINESS MANAGEMENT

BPLM 102: MANAGEMENT MATHEMATICS

STREAMS: AGBM (ODEL)   **TIME: 2 HOURS**

DAY/DATE: TUESDAY 05/10/2021   **2.30 P.M. – 4.30 P.M.**

INSTRUCTIONS

- **Answer questions one and any other two questions**
- **Do not write on the question paper**

QUESTION ONE

a) Define the following terms as used in business mathematics

i.	Random experiment	(2 marks)
ii.	Finite set	(2 marks)
iii.	Ordinary annuity	(2 marks)
iv.	Singular matrix	(2 marks)

b) Abdi deposited Sh. 25,000 in a fixed deposit account at a compound interest of 12% per annum compounded quarterly. Determine;

i.	Accumulated amount to the nearest thousands after 4 years.	(3 marks)
ii.	The time it will for the amount to grow to sh. 54,000	(5 marks)

c) A dryer manufacturer purchases heating elements form three different suppliers; Argostat, Bermrock and Thermtek. Thirty percent of the heating elements are supplied by Argostat, Fifty percent by Bermrock and the rest by Thermtek. The elements are mixed in supply bin prior to inspection and installation. Based on past experience 10% of the Argostat

elements are defective compared to only 5% of those supplied by Berrock and just 4% of those from Thermtek. An assembly worker randomly selects an element for installation.

Required:

   i.   A probability tree diagram presenting the joint probabilities.   (2 marks)

   ii.   The probability that the selected element was defective.   (2 marks)

   iii.   The probability that the selected item is defective given that was supplied by

        Argostat.   (3 marks)

   iv.   The probability that the selected item was from Argostat given that it is defective.

        (3 marks)

d) The value (V) of an investment has been found to behave according to the function:

$V(t) = 200{,}000e^{0.2t}$; where t is time in years.

   i.   What was the initial investment amount?   (2 marks)

   ii.   What would be the value of the investment after 5 years.   (2 marks)

QUESTION TWO

a) Use matrix algebra to solve the following system of simultaneous equations

$x_1 + 2x_2 + 3x_3 = 3$

$2x_1 + 5x_2 + 4x_3 = 4$

$3x_1 + 5x_2 + 6x_3 = 8$ (6 marks)

b) A firm that produces a single product has a fixed cost of sh. 600,000 per month and a variable cost of sh.40 per unit. It sells its product at a price of sh. 100 per unit and the firm is able to sell all units produced in a particular month.

   i.   Find the break-even level of monthly output.   (2 marks)

   ii.   If the firm is making a loss of sh.120,000 per month, what increase in production

        would be required to break even?   (5 marks)

c) Given that A, B and C are subsets of the universal set $U = [X:x$ is an integer less than 10 but greater than 0} and that $A = \{1,2,4,6,7,9\}$, $B = \{2,3,5,8,9\}$ and $C = \{1,3,4,5,6,8,9\}$ Determine the composition of the following sets;

   i. $A \cap B$ (2 marks)

   ii. $(A - C)^c$ (2 marks)

   iii. $n\{A \cup B \cup C\}$ (2 marks)

QUESTION THREE

a) An economy has two industries T1 and T2. The industries have the following technology matrix

$$A = \begin{pmatrix} 0.4 & 0.2 \\ 0.3 & 0.1 \end{pmatrix} \text{ and } D = \begin{pmatrix} 10 \\ 12 \end{pmatrix}.$$

    i.   Determine the gross production for each industry.   (5 marks)

    ii.   Determine the level of primary inputs.   (3 marks)

    iii.   Account for the usage of T1 output.   (2 marks)

b) Chuka Daily distributes three types of magazines namely; Newline (N), Informer (I) and Update (U). The management is intending to expand its market to Meru county hence recently conducted a market survey to determine the magazine preferences among 100 households in Meru town. The following results were obtained from the survey.

        48 households read the Newsline magazine

        18 household read the Informer magazine

        26 households read the Update magazine

        8 households read the Newsline and Update magazines

        8 households read the Newline and the Informer magazines

        3 households read the Update and the Informer magazines

        24 households read none of the three magazines.

Required; clearly showing your working;

    i.   Present this information on a Venn diagram   (3 marks)

    ii.   Determine the number of households that read all the 3 magazines (3 marks)

    iii.   How many households read exactly one magazine   (2 marks)

    iv.   How many households read Newsline but not Informer   (2 marks)

QUESTION FOUR

a) Distinguish between a single ton set and a universal set.   (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 average 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) Ausa Sacco provides low cost retail lending services. Maria wishes to borrow a loan of sh. 50,000 at the prevailing interest rate of 10% per annum on reducing balance method. The loan is to be repaid in five equal annual instalments.

Required:

i. The annual instalment amount payable. (3 marks)

ii. Prepare the respective loan amortization schedule that would guide Maria in loan repayment. (5 marks)

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