

CHUKA



UNIVERSITY

**UNIVERSITY EXAMINATIONS**

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

**BCOM 161: BUSINESS MATHEMATICS**

**STREAMS: BCOM Y1S1**

**TIME: 2 HOURS**

**DAY/DATE: TUESDAY 23/03/2021**

**8.30 P.M – 10.30 A.M**

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**INSTRUCTIONS:**

**Answer question 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) Union of sets      | [2 marks] |
| (ii) Disjoint sets     | [2 marks] |
| (iii) Ordinary annuity | [2 marks] |
| (iv) Compounding       | [2 marks] |

(b) Tembe transporters limited depreciate its fleet of trucks using a straight line method. The end of the current financial year is approaching and the external auditors are examining the books of account. However, they are unable to trace complete records concerning a truck that was purchased 4 years ago. Its current book value is 1,800,000 while its purchase cost was ksh 4,200,000. The company disposes its trucks after 5 years of usage.

**Required :**

- (i) Determine a linear function  $V = a+bt$  which relates book value  $v$  and time in years  $t$ . [3 marks]
- (ii) What would be the disposal value of the truck given that its disposed at book value. [3 marks]
- (c) Mary was recently employed by a company with initial salary of ksh 80,000 per month. The company has in place two salary schemes A and B. Salary scheme A entails an annual salary increase of ksh 40,000 at the end of year of service. Salary scheme B entails an annual salary increase of 20% of the previous year's basic salary.
- Required :**
- (i) Total basic salary to be earned by Mary during her 30 years contract under scheme A. [4 marks]
- (ii) Total basic salary to be earned by Mary during her 30 years contract under scheme B. [2 marks]
- (iii) Which scheme is lucrative? Justify your answer. [2 marks]
- (d) The value (P) of an investment can be modeled by  $P(t) = 200,000e^{0.2t}$  ; where  $t$  is time in years.
- (i) What was the initial investment amount? [2 marks]
- (ii) How long will it take for the value of the investment to double? [2 marks]

## QUESTION TWO

- (a) The relationship between total cost and 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 variables costs and fixed weekly costs of production? [5 marks]

(b) A firm that produces a single products has fixed cost of ksh 600,000 per month and a variable cost of ksh 40 per unit. It sells its product at a price of ksh 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. [3 marks]

(ii) If the firm is making a loss of ksh 120,000 per month, what increase in production would be required to break even? [5 marks]

(c) Given that P,Q and R are subsets of the universal set  $U = \{X : x \text{ is all positive integer less than } 8\}$  and that  $A = \{1,2,4,6,7\}$   $B = \{2,3,5,8\}$  and  $C = \{1,3,4,5,6\}$

Determine the composition of the following sets;

(i)  $A \cap B \cap C$  [2 marks]

(ii)  $A - (A \cap C)^c$  [3 marks]

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

### QUESTION THREE

(a) 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.

[5 marks]

(b) Kinywaji ltd produce and sell 3 flavours of soft dricks branded Tamu, Kali and Chachu. A survey involving 200 households was carried out in Msomo market to determine customers' preference on its three brands. The results obtained were as follows; A total of 52, 36 and 96 households preferred Tamu, Kali and Chachu flavors respectively. 6 households preferred Tamu and Kali, 16 preferred Chachu and Kali and 16 households still preferred Tamu and Chachu flavors. Out of the 200 households 48 preferred none of the three flavors.

**Required:**

- (i) Present the above information on a venn diagram. [3 marks]
- (ii) Determine the number of household whose preference was on all the three flavors. [3 marks]
- (iii) How many households preferred at least 2 favors. [2 marks]
- (iv) How many household preferred Chachu but not Kali flavors. [2 marks]
- (c) Use the binomial theorem to find the first three terms in ascending powers of x of  $(1 - \frac{x}{2})^4$ . Hence use your expansion to estimate the value of  $(0.992)^4$ . [5 marks]

#### QUESTION FOUR

- (a) In a recruitment interview at Chuka Univesity, a panel of 5 members is to be constituted from among 5 directors, 3 registrars and the Vice Chancellor. In how many ways can the panel be constituted if:
- (i) No restrictions on who is to be included among the 9 members. [2 marks]
- (ii) The vice Chancellor must be included. [2 marks]
- (iii) The Vice Chancellor and 2 registras must be included. [2 marks]
- (b) Ausa Sacco provides low cost retails lending services. Maria wishes to borrow a loan of ksh 200,000 at the prevailing interest rate of 12% per annum on reducing balance method. The loan is to be repaid in 4 equal annual instalments. Determine
- (i) The annual instalments payable [3 marks]
- (ii) Prepared the respective loan amortization schedule that would guide Maria in loan repayment. [5 marks]
- (c) The management of the Titan Tire Company has determined that the weekly demand and supply functions for their super tires are given by  $P = - 0.1q^2 - q + 40$  and  $P = 0.1q^2 + 2q + 20$  respectively, where p is measured price in shillings and x is hundreds of units produced and sold. Determine the equilibrium quantity and price. [6 marks]