

CHUKA

UNIVERSITY



UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF
COMMERCE

BCOM 161: BUSINESS MATHEMATICS

STREAMS: BCOM (Y1S1)(ODEL)

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 07/08/2024

8.30 A.M. – 10.30 A.M.

INSTRUCTIONS

- Answer question one and any other two question
- Clearly show your working

QUESTION ONE (30 MARKS)

- Explain the role of business mathematics in management of commercial enterprises
(5 marks)
- Explain the meaning of the following pair of terms as used in set theory
 - Single ton set (2 marks)
 - Null set (2 marks)
 - Disjoint sets (2 marks)
 - Infinite set (2 marks)
- Mkenya deposited sh. 80,000 into a fixed deposit account in Majengo Sacco at an interest rate of 14% per annum compounded quarterly. He got an emergency at the end of the 3rd year and withdrew sh. 35000. Determine the account balance at the end of the 5th year.
(4 marks)
- The profit of a company are given by the following equation: $\text{profit}(Z) = -56,000 - 1200P - 4P^2$ where p is the price of the product. Calculate the price at which the profit is zero.
(4 marks)
- Mashariki Ltd produce and sell a product whole demand function can be modelled by the function $P = Q + 50 + \frac{500}{Q}$. The annual cost of production is sh. 250 addition to sh. 85 for each product produced and sold. Given that Q is the number of units produced and sold by the firm determine;

- i) Total revenue function (2 marks)
- ii) Total cost function (2 marks)
- iii) Break even sales level (4 marks)
- iv) Price per unit at break even point (3 marks)

QUESTION TWO (20 MARKS)

- a) Matunda cosmetics has a salon section located in Matunda Market and has invited a team 450 lady clients to determine their preferences to its three specialized type of hair styles so as to organize a package for service promotion. The three types of styles in consideration were "Twist", "Braids" and "Lines". It was found that 255, 150 and 210 clients preferred Twists, Braids and Lines respectively. 60 clients preferred Twist and braids, 45 preferred Braids and Lines while 90 clients preferred Twist and Lines. 15 clients preferred none of the of the three hair styles on offer

Required:

- i) Present the above information on a venn diagram (3 marks)
 - ii) How many clients preferred all the three hair styles under consideration?(3 marks)
 - iii) How many clients preferred at most one hair style? (2 marks)
 - iv) How many clients preferred Twist but not lines? (2 marks)
- b) The relationship between production cost and number of units sold at Kienyenji Ventures is a linear function. It would cost sh. 875 to produce 26 units and sh. 1085 to produce 40 units. Determine the firm's fixed production cost and the variable cost per unit. (4 marks)
- c) A wedding committee of 4 members is to be constituted from among 6 women, 4 men religious and the church Pastor. In how many ways can the tribunal be formed such that:
- i) No restriction on who is to be included among the 11 members (2 marks)
 - ii) The church pastor must be included (2 marks)
 - iii) At least two Women and the pastor must be members of committee (2 marks)

Question three (20 marks)

- a) Mgeni Ltd is launching a new product whose demand has been estimated by the function $Q = 500 + 10e^{0.6t}$ where Q is the quantity of units demanded while t is the time in months since the launch of the product; Required:
- i) Initial quantity of units demanded at the launch of the product (2 marks)

- ii) The quantity demanded 10 months after the launch (3 marks)
- iii) After how many months to the nearest whole number will the quantity demanded be 1000 units? (4 marks)
- b) Given that A, B and C are subsets of the universal set $U = \{a, b, c, d, e, f, g\}$ and that $A = \{b, f, g\}$, $B = \{c, d, f\}$ and $R = \{c, d, e, g\}$. Determine the composition of the following sets;
 - i) $A^c \cap B$ (2 marks)
 - ii) $A \cap B \cap C$ (2 marks)
 - iii) $B - A$ (2 marks)
- c) Use the binomial theorem to expand $\left(1 - \frac{x}{2}\right)^4$ and hence use your expansion to estimate the value of $(0.88)^4$. (5 marks)

Question four (20 marks)

- a) Distinguish between annuity due and ordinary annuity as applied in commercial mathematics. (2 marks)
- b) Wenyenji Sacco provides low cost retail lending services in Kibagendi Market. Abdi wishes to borrow a loan of sh. 100,000 at the prevailing interest rate of 10% per annum on reducing balance method and the loan is to be repaid in 4 equal annual instalments

Determine;

- (i) The annual instalment payable (3 marks)
- (ii) Prepare the respective loan amortization schedule that would guide Abdi in loan repayment. (5 marks)
- c) The total revenue function of passion fruits (sold in cartons) in Sokomoko market is modeled as $TR = 500x - 2x^2$. The farmers have also analyzed the total cost function of the fruits as $TC = 2x^2 + 100x + 3600$; where x is the number of cartons of passion fruits produced and sold. Required:
 - i) Profit function (3 marks)
 - ii) The profit/loss after selling 1000 cartons of the fruits (3 marks)
 - iii) The production level at which a farmer will breakeven (4 marks)

.....