

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EMBU CAMPUS

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

BCOM 161: BUSINESS MATHEMATICS I

STREAMS: BCOM Y1S2

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) Discuss any 5 areas of application of business mathematics in management. [5 Marks]

(b) Given that $A = \{e, f, g, h, k\}$, $B = \{a, c, f, k\}$ and $C = \{g, f, k\}$ are subsets of the universal set $U = \{x: x \text{ are first 15 letters of alphabet}\}$, determine the composition of the following set relations:

- (i) $A \cap B$ [2 Marks]
- (ii) $(A \cup B)^c$ [2 Marks]
- (iii) $n(B \cup C)$ [2 Marks]
- (iv) $A - (A \cap C)$ [2 Marks]

(c) The daily sales of bread in Mikate Market is modeled by the function;
 $S = 200 + 400e^{-0.003x}$ where x is the number of breads sold in a day and x is the number of days after an advertising campaign.

Required:

- (i) How many loaves of bread were sold 50 days after an advertising campaign? [3 Marks]
- (ii) After how many days to the nearest whole number should a new campaign start if the daily sales should not fall below 300 loaves? [3 Marks]

BCOM 161

- (d) In XYZ Ltd, the total production cost is given by $Tc = 3q^2 + 12q - 2$ where Tc is total cost while q is the quantity produced and sold in units. The selling price per unit is Kshs.5.

Required:

- (i) The total revenue function [2 Marks]
- (ii) The profit function [2 Marks]
- (iii) The break-even point in units [4 Marks]
- (iv) The level of production that would earn a profit of Kshs.22,000 [3 Marks]

QUESTION TWO

- (a) Radi has an opportunity of investing in a five-year investment plan A where returns are Kshs.20,000 at the end of each year for five years or alternative investment plan B whose returns are Kshs.18,000 at the start of each year for five years. Given that the prevailing rate is 10% per annum, advise him on the best investment plan if the objective is to maximize the cumulative returns. [6 Marks]
- (b) Toyota motor corporation conducted a survey on Meru-Nairobi highway drivers' preference of its three car brands; Hino, Lexus and Ranz. The survey involved 190 drivers and the following information was obtained:

100 drivers' preference was on Hino brand
80 drivers' preference was on Lexus brand
90 drivers' preference was on Ranz brand
35 drivers' preference was on the Hino and Lexus
33 drivers' preference was on Lexus and Ranz
48 drivers' preference was on Hino and Ranz
23 drivers' preference was on none of the three brands

Required:

- (i) A Venn diagram representing the above information. [4 Marks]
 - (ii) The number of drivers whose preference was on all the three brands. [2 Marks]
 - (iii) The number of drivers whose preference was at least 2 brands. [2 Marks]
 - (iv) Number of drives who preferred Hino but not Lexus brands. [2 Marks]
- (c) Define the following terms as used in set theory
- (i) Singleton set [2 Marks]
 - (ii) A finite set [2 Marks]

QUESTION THREE

- (a) Define the following terms as used in financial mathematics;
- (i) Annuity [2 Marks]
 - (ii) Compounding [2 Marks]
 - (iii) Perpetuity [2 Marks]

BCOM 161

(b) Matone is a member of Mvua Sacco. He is contemplating borrowing a loan of Kshs.300,000 from the Sacco but doubts his financial ability to repay. The Sacco charges 10% per annum interest on reducing balance method and the repayment period is 5 years.

Determine;

- (i) The annual installment amount payable. [3 Marks]
- (ii) A loan amortization schedule that would guide Matone in loan repayment. [5 Marks]

(c) A sample of 8 respondents is to be formed out of 8 students, 6 teaching staff and the Vice Chancellor in a survey regarding the effectiveness of leadership structure of University Students Association. In how many ways can the sample be formed if:

- (i) There is no restriction on who to include in the sample. [2 Marks]
- (ii) The Vice Chancellor must be in the sample. [2 Marks]
- (iii) There should be 3 teaching staff, 4 students and the Vice Chancellor in the sample. [2 Marks]

QUESTION FOUR

(a) Use binomial theorem to expand $(2x - 3)^5$ hence or otherwise estimate the value of $(1.008)^5$ [6 Marks]

(b) Fadhili, a Bachelor of Commerce graduate of Chuka University has been offered two identical jobs by different Companies X and Y.

Company X offer: The starting salary is Kshs.20,000 with an annual increment of Kshs.1,000

Company Y offer: The starting salary is Kshs.10,000 with an annual increment of 10%.

The pay rises are to be effected at the end of each year. What would be the difference in the cumulative salaries between the two jobs at the end of the 10th year? (Apply sequence and series). [7 Marks]

(c) Huduma Ltd has a fixed production cost of Kshs.28,000 and a variable cost per unit of $\frac{2}{5}x + 222$ shillings where x is the number of units produced. Given that the selling price of its products is $1250 - \frac{3}{5}x$ shillings per unit, determine the production level at which the firm will break-even. [7 Marks]

.....