

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

CHUKA, EMBU & THARAKA

**FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF
BACHELOR OF COMMERCE / BACHELOR OF COOPERATIVE MANAGEMENT/
BACHELOR OF ENTREPRENEURSHIP AND ENTERPRISE MANAGEMENT**

BCOM 161: BUSINESS MATHEMATICS I

STREAMS: BCOM YISI

TIME: 2 HOURS

DAY/DATE: MONDAY 10/12/2018

2.30 PM – 4.30 PM

INSTRUCTIONS:**Answer Question One and any other Two Questions****QUESTION ONE (30 MARKS)**

- (a) Explain the role of business mathematics in commercial organizations. [4 marks]
- (b) Given that the supply function of an item is $P=Q^2+100$ while the demand function is defined by $P+20Q=2500$. Determine quantity at which market equilibrium occurs. [6 marks]
- (c) Explain the following terms as used in business mathematics
- | | |
|--------------------------|-----------|
| (i) Finite set | [2 marks] |
| (ii) Marginal cost | [2 marks] |
| (iii) Market Equilibrium | [2 marks] |
| (iv) Annuity due | [2 marks] |
- (d) A fixed deposit of sh. 20,000 at KMG bank earns a compound interest at 6% p.a for a period of four years. The amount accumulated is then reinvested at 6% p.a compounded monthly for the next 2 years. What is the value of the deposit at the end of the holding period (6th year)? [6 marks]

(e) A company has fixed costs of sh. 28,000 and variable cost per unit of $\frac{2}{5}x + 222$ shillings, where x is the total number of units produced. Suppose further that the selling price of its product is $1250 - \frac{3}{5}x$ shillings per unit, find the profit when 1000 units are sold.

[6 marks]

QUESTION TWO (20 MARKS)

(a) Distinguish permutation and combination

[2 marks]

(b) Consider the word INTEGRAL

(a) How many permutations are possible if all the letters are taken at once?

[2 marks]

(b) In how many of the permutations in (i) above (i) is **A** and **G** next to each other?

[2 marks]

(c) Determine the composition of the given sets if $P = \{p : p \text{ is an even positive integer less than } 12\}$, $R = \{1,3,5,7,9\}$ and $Q = \{2,4,6,7\}$

(a) $P \cap Q$

[2

marks]

(b) $n\{R \cup P\}$

[2 marks]

(d) Don C credit is a non-deposit taking micro-finance providing low cost consumer loan services. A client wishes to borrow a loan to be repaid in equal five annual installments of \$ 1285.46. A section of the loan repayment schedule is provided in the table below.

Year	Beginning Balance	Annual installment amount	Interest payment	Principal payment	Ending balance
1	??	1285.46	450	??	4164.54
2	??	1285.46	??	??	??
3	??	1285.46	??	??	??
4	??	1285.46	??	??	??
5	??	1285.46	??	??	??

Required:

Complete the table

[4 marks]

(e) The demand function for a certain product is given by $100e^{0.01x}$ where P is the price per unit (in sh. 000) when x units are sold. Suppose the total cost function is given by $TC=400x$

(i) What quantity of the product (to the nearest whole number) will be demanded at a price of sh. 2000 [2 marks]

(ii) Calculate the break-even quantity (to 1 d.p) and price for the product at that point. [4

marks]

QUESTION THREE (20 MARKS)

(a) The sum of the series $1+8+15+ \dots$ is 396. How many terms does the series contain? [2

marks]

(b) The number of items, y, produced each day by an assembly line worker, x days after initial training period is modelled by $y=120-80e^{-0.3x}$ where y=number of units completed per day and x = number of days of experience of employees.

Required:

(i) Number of units produced per day after 10 days of experience [2 marks]

(ii) After how many hours will production rate be 90 units? [4 marks]

(c) A company has a customer base of 20,000 and projects a growth rate of 2% per year for the next 20 years. What will be the number of customers in the 20th year? (Apply Sequences and Series) [3

marks]

(d) Use the binomial theorem to find the first three terms in ascending powers of x of $\left(1-\frac{x}{2}\right)^4$. Hence use your expansion to estimate the value of $(0.992)^4$ [5

marks]

(e) Juma wants invest in an insurance policy that requires a deposit of ksh. 10,000 at the end of each year for 8 years. The policy provides compound interest rate at 9% p.a. how much would have accumulated at the end of the 8th year? [4 marks]

QUESTION FOUR (20 MARKS)

- (a) Suppose the profit function of a firm's product is linear and the marginal profit is ksh. 5. If the profit is equal to sh. 200 when 125 units are sold. Write down the equation of the profit function and hence determine the quantity of sales where the firm will break even.

[6

marks]

- (b) A loan of €2500 at $6\frac{1}{2}\%$ p.a interest can be repaid by ten installments of € 347.76, each being paid at the end of the year. What is the remaining balance of the loan after six years?

[6 marks]

- (c) Consider the following data on students in Eco-tourism management department. It was found that 130 studied French, 90 studied German, 84 studied Russian, 40 studied French and Russian, 30 studied German and Russian, 50 studied French and German while 16 studied all the three languages. 119 students were not studying any of the language. Let F, G and R denote sets of students studying French, German and Russian respectively.

- (i) Represent the data using a Venn diagram.

[2 marks]

Fill the number of students:

- (ii) Who were actually involved in the survey
 (iii) Studying exactly one language
 (iv) Studying exactly two languages.

[2 marks]

[2 marks]

[2 marks]