

LAIKIPIA



UNIVERSITY

# UNIVERSITY EXAMINATIONS

1<sup>ST</sup> SEMESTER 2023/2024 ACADEMIC YEAR

FIRST YEAR EXAMINATION FOR THE DEGREE OF  
BACHELOR OF COMMERCE

**BCOM 114: BUSINESS MATHEMATICS I**

***STREAM:***

***TIME: 2 HRS***

***DAY: TUESDAY [14.30-16.30 P.M]***

***DATE: 5/12/2023***

**THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES**

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**INSTRUCTIONS:** Answer **QUESTION ONE** and any **OTHER TWO** questions

**QUESTION ONE**

- a) The population growth of a country was 100 million in 1990. It has since grown at 4% per annum. The growth rate is exponential of the form  $P = a e^{kt}$  such that p = population, k = growth rate, t = time in years, a = a constant, e= 2.5937

**Required:**

- i) Identify the function which describes population growth through time? **(4 Marks)**
- ii) Compute the population in the year 2010? **(4 marks)**

- b) The resale value v, of a certain piece of industrial equipment has been found to be described by the function  $V=100(e^{-0.1t})$  where t = time and depreciation rate = 10%.

**Required:**

- i) Compile the purchase cost of the equipment **(4 marks)**
  - ii) Determine the expected re-sale value after: i) 5 years, ii) 10 years **(6 marks)**
- c) Solve the following simultaneous equations **(7 marks)**

$$x^2 + y^2 = 20 \dots\dots\dots i$$

$$3x = 2 - y \dots\dots\dots ii$$

- d) Solve the following pair of equations by substitution method; **(5 Marks)**
- $2x - 3y = 8 \dots\dots\dots i.$
- $3x + 4y = -5 \dots\dots\dots ii.$

**QUESTION TWO**

- a) Explain a set? **(1 marks)**
- b) Explain with examples the following terms as used in set theory **(10 Marks)**
  - i) Finite set
  - ii) Universal set
  - iii) Null set
  - iv) Equal or equivalent sets
  - v) Complement of a set



c). Consider the following universal set T and its subjects C, D and E

$T = \{0, 2, 4, 6, 8, 10, 12\}$   $C = \{4, 8, \}$   $D = \{10, 2, 0\}$   $E = \{0\}$ . Using sets and Venn Diagrams, Find

i)  $D \cap E$  (3 Marks)

ii)  $C \cap D \cap E$  (3 Marks)

d). The second and fifth terms of a geometric

progression are 16 and 2 respectively. Determine the common ratio and the first term. (3 Marks)

### QUESTION THREE

a) Mr. Ngeny borrowed Kshs560,000 from a bank to buy a piece of land. He was required to repay the loan with simple interest for a period of 48 months. The Repayment amounted to Kshs21,000 per month. Calculate

i) The interest paid to the bank (5 Marks)

ii) The rate per annum of the simple interest (5 Marks)

b) A house is to be sold either on cash basis or through a loan. The cash price is Kshs.750,000. The loan conditions are as follows: there is to be down payment of 10% of the cash price and the rest of the money is to be paid through a loan at 10% per annum compound interest. A customer decided to buy the house through a loan.

i) Calculate the amount of money loaned to the customer. (5 Marks)

ii) The customer paid the loan in 3 year's. Calculate the total amount paid for the house (5 Marks)

### QUESTION FOUR

a) If  $X=1/2$ ,  $y=1/4$  and  $z=2/3$  Find the value of

i)  $X + yz$  (2 Marks)

ii)  $Y - xz$  (2 Marks)

b) Three business partners, Asha, Nangila and Cherop contributed Kshs60,000, Kshs 85,000 and Kshs105,000 respectively. They agreed to put 25% of the profit back into business each year. They also agreed to put aside 40% of the remaining profit to cater for taxes and

insurance. The rest of the profit would then be shared among the partners in the ratio of their contributions. At the end of the first year, the business realized a gross profit of Kshs225,000.

- i) Calculate the amount of money Cherop received more than Asha at the end of the First year **(5 Marks)**
- ii) Nangila further invested Kshs25,000 into the business at the beginning of the Second year. Given that the gross profit at the end of the second year increased in the ratio 10:9, calculate Nangila’s share of the profit at the end of the second year **(5 Marks).**
- iii) Using the Net present Value (NPV) approach, determine whether John should invest in or reject a project which requires a cash outlay of KES800,000 and the following projected net cash inflows over a period of 5 years with no salvage value. Ignore taxation. Rate of interest is 12% p.a **(6 Marks)**

Year	1	2	3	4	5
Net Cash Inflow	150000	280000	540000	600000	450000

**QUESTION FIVE**

- a) A market researcher investigating consumers’ preference for three brands of beverages namely: coffee, tea and cocoa, in Ongata town gathered the following information: From a sample of 800 consumers, 230 took coffee, 245 took tea and 325 took cocoa, 30 took all the three beverages, 70 took coffee and cocoa, 110 took coffee only, 185 took cocoa only.

**Required:**

- i) Present the above information in a Venn Diagram. **(4 marks)**
- ii) The number of customers who took tea only. **(2 marks)**
- iii) The number of customers who took coffee and tea only. **(2 marks)**
- iv) The number of customers who took tea and cocoa only. **(2 marks)**
- b) The number of customers who took none of the beverages. **(2 marks)**
- c) The eleventh term of an arithmetic progression is four times its second term. The sum of the first seven terms of the same progression is 175
  - i) Find the first term and common difference of the progression **(4 Marks)**
  - ii) Given that P<sup>th</sup> term of the progression is greater than 124, find the least value of P **(4 Marks)**

