KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2023/2024 ACADEMIC YEAR
FIRST YEAR, SECOND SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
(BUSINESS ADMINISTRATION)

Date: 16th August, 2023
Time: 11.30am –1.30pm

KBA 106   - BUSINESS MATHEMATICS

INSTRUCTIONS TO CANDIDATES_____

ANSWER **QUESTION ONE (COMPULSORY)** AND **ANY OTHER TWO** QUESTIONS_____

QUESTION ONE (30 MARKS)

a)   KWUST brick wall in the west gate contains 52 bricks in its bottom row and 49 bricks in the next
      row up from the bottom row. Each subsequent row contains 3 fewer bricks than the row
      immediately below it. If the wall contains 16 rows, how many bricks total make up the wall?
      (4 marks)

b)   Given the sets $A = \{1,2,3,4,5,6,12\}, B = \{a, b, c, d, x, y, z\}$ and $C = \{b, d, g, h, k\}$. Find

   i) $A \cap B$ (1 mark)
   ii) $(A \cup B) \cup C$ (2 marks)
   iii) $(B \cup C) - A$ (3 marks)

c)   What sum of money will amount to Ksh. 561,600 in 4 years kept in an account that gives 2% p.a.
      simple interest?
      (4 marks)

d)   Solve the following quadratic equation by completing the square method $x^2 + 4x - 12 = 0$
      (3 marks)

e)   Solve the following simultaneous equation using substitution method
            $2x + y = 6$ (3 marks)
            $y - 5x = 2$

f)   A single deposit of Sh.150000 is invested for four years at a compound interest. Determine the rate
      at which the investment will be Sh. 182,326 if compounded annually.
      (3 marks)

g)   Find the derivatives the following functions

i) $\dfrac{1}{24x^6}$ (2 marks)

ii) $(3x + 2)(x^3 + 4)$ (2 marks)

h) Solve $\dfrac{3x-1}{x+3} = \dfrac{3x+2}{x+1} = 3$ (3 marks)

QUESTION TWO (20 MARKS)

a) Safaricom (Kenya Ltd) surveyed 400 of its customers to determine the way they learned about the new Tubonge tariff. The survey shows that 180 learned about the tariff from radio, 190 from television, 190 from newspapers, 80 from radio and television, 90 from radio and newspapers, 50 from television and newspapers, and 30 from all three forms of media.
   i) Draw a Venn diagram to represent this information (5 marks)
   ii) Using your Venn diagram determine the number of customers who learned of the tariff from at least two of the three media. (3 marks)
   iii) Determine the number of customers who learned of the tariff from exactly one of the three media. (2 marks)
   iv) Determine the number of customers who did not learn of the tariff any of the three media. (2 marks)

b) Solve the following quadratic equations using the stated method;
   i) $x^2 + 2x + 2 = 0$ (completing squares) (4 marks)

   ii) $3x^2 = x + 10$ (factorization) (4 marks)

QUESTION THREE (20 MARKS)

a) Derive the quadratic formula by solving the equation $ax^2 + bx + c = 0$ where a, b and c are real numbers and $a \neq 0$ hence use the derived formula above to solve the equation $2x^2 + 7x - 15 = 0$.
   (6 marks)

b) The expenditure of 10 men and 8 boys' amount to £160. If 4 men together spend £18 more than 6 boys, how much does each man and boy spend? (5 marks)

c) Let X, Y and Z denote the cost of 3 different commodities produced by a company in Kariobangi. The combination of the levels of production can be summarized as follows;
$$6x + 5y + 3z = 16$$
$$4y + 8x + 5z = -8$$
$$3z + 7x + 6y = 0$$
   Determine the cost of each commodity using matrix method; (9 marks)

QUESTION FOUR (20 MARKS)

a) A grocery store display of soap cans has sixteen rows with each row having one less can than the row below it. If the bottom row has twenty eight cans, how many cans are in the display?
   (4 marks)

b) An apartment complex has 250 apartments to rent. If they rent x apartments then their monthly profit, in dollars, is given by $P(x) = -8x^2 + 3200x - 80000.$

How many apartments should they rent in order to maximize their profit?

(5 marks)

c) An event manager has ten patterns of chairs and eight patterns of tables. In how many ways can he make a pair of tables and chairs? (3 marks)

d) A survey of 500 television viewers produced the following information. 280 watch football, 190 watch hockey, 115 watch basketball, 45 watch football and basketball, 70 watch football and hockey, 50 watch hockey and basketball. 50 do not watch any of the three games.

    i) How many watch all the three games? (4 marks)
    ii) How many watch exactly one of the three games? (4 marks)

QUESTION FIVE(20 MARKS)

a) If Sh.100,000 is invested for four years at compound interest, it will amount to Sh.542370. Find;
    i) interest rate applied in this investment if compounded annually

(3 marks)

    ii) interest earned over the four years

(2 marks)

b) The marginal cost function of manufacturing x units of a commodity is $6 + 10x - 6x^2.$ Find the total cost and the average cost, given that the total cost of producing 1 unit is 15.

(7 marks)

c) The cost of one text book is t shillings and the cost of one pen is sh. p. John spent Sh. 240 to buy 2 text books and 5 pens while Peter spent Sh. 280 to buy 2 textbooks and 8 pens. Using matrix method, find the cost of each item.

(8 marks)