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: 14th December, 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) Given that the sets
$U = \{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p\}$, $A = \{a, b, c, d\}$, $B = \{h, i, m, o\}$ and $C = \{b, d, g, h, k\}$
represent this information in a Venn diagram. (3 marks)

b) If Ksh. 7500 is invested for 4 years at compound interest, at what rate will the money amount to Ksh. 9116 if compounded annually? (3 marks)

c) A profit of Ksh. 126000 is shared among 3 business partners, Ann, Bett and Charles. Charles gets Ksh 6000 more than Bett while Ann gets twice as much as Charles. Find how much each gets? (4 marks)

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

e) KWUST intends to construct a new gate for students' convenience. If the brick wall in the gate will contain 52 bricks in its bottom row and 49 bricks in the next row up from the bottom row with each subsequent row containing 3 fewer bricks than the row immediately below it, find the bricks total that make up the wall if the wall contains 16 rows. (4 marks)

f) Consider the following matrices
$A = \begin{pmatrix} 2 & 4 \\ 3 & 6 \\ 1 & 8 \end{pmatrix}$ and $B = \begin{pmatrix} 5 & 4 \\ 2 & 4 \\ 9 & 1 \end{pmatrix}$
Compute $A^T B$ (4 marks)

g) Evaluate $\frac{10!}{3!8!}$ and hence write $50 \times 49 \times 48 \times 47 \times 46$ in factorial form.

(3 marks)

h) Solve $\frac{3x-1}{x+3} = \frac{3x+2}{x+1} = 3$ (4 marks)

i) Find the integral of the following function
$\int (x^5 + 4x^3 + x^2 + 6) dx$ (2 marks)

QUESTION TWO (20 MARKS)

a) A customer deposited Ksh. 43,000 in a savings account that yields 2% p.a compounded annually

    i) How long will it take to amount to Ksh. 47,500?

          (3 marks)

    ii) What is the compound interest?

          (2 marks)

b) A market researcher investigating consumers' preference for three brands of beverages namely: coffee, tea and cocoa, in KWUST gathered the following information: From a sample of 800 consumers, 230 took coffee, 245 took tea and 325 took cocoa, 100 took tea and cocoa, 80 took coffee and tea, 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) Find the number of customers who took tea only   (2 marks)

    iii) Find the number of customers who took all the three drinks.   (2 marks)

    iv) Find the number of customers who took at most two drinks   (2 marks)

    v) Find the number of customers who took none of the beverages   (2 marks)

c) What sum of money will amount to Ksh. 21,600 in 4 years kept in an account that gives 2% p.a simple interest?   (3 marks)

QUESTION THREE (20 MARKS)

a) During a market day in Mwihoko, the KWUST chef finds out that the cost of 3 sheep and 2 goats is Ksh. 7200. If 4 sheep and a goat costs Ksh 7600. Find the cost of two goats and a sheep.

          (4 marks)

b) Let x, y and z denote the cost of 3 different sugar brand from Mumias sugar company limited. The combination of the levels of production can be summarized as follows;

$$7x + 5y + 3z = 16$$
$$3x + 2z - 5y = -8$$
$$-7z + 5x + 3y = 0$$

Find the values of x, y, z

          (12 marks)

c) Derive the quadratic formula by solving the equation $ax^2 + bx + c = 0$ where a, b and c are real numbers and $a \neq 0$ (4 marks)

QUESTION FOUR (20 MARKS)

a) Let $A = \{a, b, c, d, e, f, g, h\}$ and $B = \{e, f, g, h, I, j, k, l, m, n, o, p\}$. Find

    i) $A \cup B$ (1 mark)

    ii) $A \cap B$ (1 mark)

    iii) $A - B$ (1 mark)

    iv) $B - A$ (1 mark)

b) The class representative wants to open a class welfare kitty to support the needy students in the class. Each member contributes some amount towards the same. She realizes that after contribution the total amount is KES 10000 which is unsafe for her to keep and rushes to Equity bank Githurai

branch on 1st January 2022. If at the beginning of each year, some well-wishers would top up the money with KES 3000, how much money will be in the bank on 31st December 2025 if the money attracts a compound interest of 15 percent per annum? (5 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.

(6 marks)

d) The cost of production per day for some widget is given by
$C(x) = 2500 - 10x - 0.01x^2 + 0.0002x^3$ What is the marginal cost when
$x = 300$ and $x = 200$ (5 marks)

QUESTION FIVE(20 MARKS)

a) A committee of 5 people is to be selected from 6 men and 4 women.

Find;
i) the number of different ways in which the committee can be selected

(2 marks)

ii) the number of these selections with more women than men

(3 marks)

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

(3 marks)

ii) interest earned over the four years

(2 marks)

c) 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.

(5 marks)

d) Solve the following simultaneous equations using the indicated method
i) $2x + y = 12$
    $y - 3x = 2$ (Matrix) (3 marks)

ii) $5x + y + 6 = 8$
     $y - 2 + 6x = 12$ (Substitution) (2 marks)