Kasarani Campus
Off Thika Road
P. O. Box 49274, 00101
NAIROBI
Westlands Campus
Pamstech House
Woodvale Grove
Tel. 4442212
Fax: 4444175

KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2024/2025 ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
(HOSPITALITY MANAGEMENT)
KBA 2100 BUSINESS MATHEMATICS

Date:14th August 2024
Time: 11.30am-1.30pm

INSTRUCTIONS TO CANDIDATES:
ANSWER **QUESTION ONE (COMPULSORY)** AND ANY OTHER **TWO QUESTIONS**

QUESTION ONE (30 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) If $\begin{pmatrix} 2x & 4 \\ 4 & 2 \end{pmatrix}$ is a singular matrix, find the value of x (4 marks)

c) Find the sum of the series 1 + 3·5 + 6 + 8·5 + . . . + 101 . (4 marks)

d) Solve the inequality $3 - 2x \geq 15$ (3 marks)

e) In 2022, there were 1,000,000 citizens in a town. If the population increases by 8% every year, then how many citizens will there be in 10 years? Round your answer to the nearest integer. (4 marks)

f) Solve the following simultaneous equations using the indicated method
$5x + 2y = 8$
$2y - 4x = 6$ (elimination method) (3 marks)

g) Find the derivatives of the following functions
   i) $y = 3x^6 + 2x + 8$ (2 marks)
   ii) $y = \sqrt[2]{x^5} + 3x$ (2 marks)

h) A single deposit of Ksh. 150000 is invested for four years at compound interest. Determine the rate at which the investment will be Ksh. 182326. (4 marks)

QUESTION TWO (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) Find the derivative of the following functions
   i) $y = \frac{x+2}{\cos 3x}$. (2 marks)
   ii) $y = (2x^2 - 1)^3$. (2 marks)
   iii) $y = e^{2x} \sin 6x$ (2 marks)

c) The population of a city is P = 250,342e$^{0.012t}$ where t = 0 represents the population in the year 2010.

i) Find the population of the city in the year 2020. (3 marks)
ii) Find the population of the city in the year 2025. (3 marks)
iii) Find when the population will be 320,000. (4 marks)

QUESTION THREE (20 MARKS)

a) The inverse demand and supply functions for a commodity are
Inverse demand function: $P_d = 400 - 0.3Q$
Inverse supply function: $P_s = 40 + 0.3\ Q$
Where P shows the market price and Q shows the quantity. Subscript d represents demand and subscript s represents the supply. Calculate the equilibrium price. (5 marks)

b) Use the quadratic formula to solve the equation $2x^2 + 7x - 15 = 0$ (3 marks)

c) Find the inverse of the matrix *M* where $M = \begin{pmatrix} 3 & 2 \\ 2 & 5 \end{pmatrix}$ (4 marks)

d) Given that $A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 3 & 2 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 4 \\ -1 \\ 3 \end{pmatrix}$ find $(AB)^T$ (3 marks)

e) Given $U = \{1,2,3,4,5,\cdots,10,12\}$, $A = \{1,2,3,4,5\}$, $B = \{2,4,6,8,10\}$ and $C = \{3,4,5,6,7\}$. Find

i) $(A \cup B$ (1 mark)
ii) $A \cap B$ (1 mark)
iii) A' (1 mark)
iv) $(B \cup C)'$ (1 mark)
v) $(A \cap C)'$ (1 mark)

QUESTION FOUR (20 MARKS)

a) Use completing the square method to solve for x in the function $2x^2 - 5x + 2 = 0$ (4 marks)

b) In the 2022 summer Olympic games, 40 countries won gold medals, 45 won silver medals, 50 won bronze medals, 28 won both gold and silver medals, 33 won both gold and bronze medals, 36 won silver and bronze medals and 25 won gold, silver and bronze medals.
Required Represent this information using Venn's diagram (4 marks)
find;

i) How many countries won only gold medals? (2 marks)
ii) How many countries won only silver medals? (2 marks)
iii) How many countries won only bronze medals? (2 marks)
iv) How many countries won gold and silver medals but no bronze medals? (2 marks)

c) A ball is dropped from a table that is twenty four inches high. The ball always rebounds three fourths of the distance fallen. Approximately how far will the ball have traveled when it finally comes to rest? (4 marks)

QUESTION FIVE (20 MARKS)

a) In a bag containing black and white balls, half the number of white is equal to a third the number of black, and twice the total number of balls exceeds three times the number of black balls by four. How many balls did the bag contain? (4 marks)

b) Solve the following simultaneous equations using elimination method (4 marks)

$$6x + 5y = -6$$
$$18x + 7y = 6$$

c) Solve the following pair of simultaneous inequalities and draw a number line. $3 - x < 5, \quad 2x - 5 < 7$ (5 marks)

d) Let, A = {2, 4, 6, 8, 10} B = {x : x is positive even integer less than or equal to 10} Determine whether set A and B are equal sets. (2 marks)

e) If Sh.500,000 is invested for four years at compound interest, it will amount to Sh.842370. Find;

i) the interest rate applied in this investment (4 marks)

ii) interest earned over the four years (1 mark)