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KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSI TY EXAMINATION, 2024/2025 ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
FOR THE BACHELOR OF PROCUREMENT & SUPPLY CHAIN MANAGEMENT
KBA 2100: BUSINESS MATHEMATICS

Date:18TH April,2024
Time:11.30AM-1.30PM

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

QUESTION ONE (30 MARKS)

a) Suppose that *A* is the set of sophomores at your school and *B* is the set of students taking business mathematics at your school. Use the appropriate set operation to express each of these sets in terms of *A* and *B*.

i. the set of sophomores taking business mathematics in your school. **(1 Mark)**

ii. the set of sophomores at your school who are not taking business mathematics. **(1 Mark)**

iii. the set of students at your school who either are sophomores or are taking business mathematics. **(1 Mark)**

iv. the set of students at your school who either are not sophomores or are not taking business mathematics. **(1 Mark)**

b) If $\begin{pmatrix} 2x & 4 \\ 4 & 2 \end{pmatrix}$ is a singular matrix, find the value of x. **(4 Marks)**

c) A group of young women decided to raise Ksh. 480,000 to start business. Before the actual payment was made, four of the members pulled out and each of those remaining had to pay an additional Ksh. 20,000. Determine the original number of the members. **(5 Marks)**

d) Solve the following inequality $3 - 2x \geq 15$ **(3 Marks)**

e) Solve the following simultaneous equations using matrix method.

$$5x + 2y = 8$$
$$2y - 4x = 6$$

(3 Marks)

f) Find the derivatives of the following functions;

i. $y = 3x^6 + 2x + 8$ **(2 Marks)**

ii. $y = \sqrt[2]{x^5} + 3x$ **(2 Marks)**

g) Integrate the following functions with respect to x;

i. $y = \frac{(3x+4)}{2x}$ **(2 Marks)**

ii. $y = x^{-7} + \sqrt[3]{4x^5}$ **(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) Explain the meaning of equal matrices the solve for x and y given that

$$\begin{pmatrix} x+y & 7 \\ 2 & y \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 2 & 3 \end{pmatrix}$$

(3 Marks)

b) In marketing a certain product, a company has discovered that the demand for the product is represented by $p(x) = \frac{50}{\sqrt{x}}$. The cost of producing x items is given by $c(x) = 0.5x + 500$. Find the price per unit that will yield maximum profit. **(7 Marks)**

c) Let x, y and z denote the cost of 3 different commodities produced by a company in Mwihoko. The combination of the levels of production can be summarized as follows;

$$x + 2y - z = 7$$
$$2x - 3y - 4z = -3$$
$$x + y + z = 0$$

Determine the cost of each commodity using matrix method; **(10 Marks)**

QUESTION THREE (20 MARKS)

a) (i) Derive the quadratic formula by solving the equation $ax^2 + bx + c = 0$ where a, b and c are real numbers and $a \neq 0$. **(5 Marks)**

(ii) Use the formula derived above to solve the equation $2x^2 + 7x - 15 = 0$ **(3 Marks)**

b) (i) Find the inverse of the matrix M where $M = \begin{pmatrix} 3 & 2 \\ 2 & 5 \end{pmatrix}$ and hence solve the matrix equation $MX = C$ in which $X = \begin{pmatrix} x \\ y \end{pmatrix}$ and $C = \begin{pmatrix} 10 \\ 3 \end{pmatrix}$ **(4 Marks)**

(ii) 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)**

c) 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 complete the square method to solve for x in the function $2x^2 - 5x + 2 = 0$ **(4 Marks)**

b) Out of a group of 85 people, 30 invested in the stock market, 45 had certificates of deposits (CD's) and 44 had saving bonds. Furthermore, 23 had both CD's and bonds, 13 had both CD's and stocks and 13 had stocks and bonds. Finally, 10 of the people had no investments. Use a Venn diagram to determine how many of the people had:

i. All the three types of investments **(2 Marks)**

ii. At least two investments **(2 Marks)**

iii. At most two investments. **(2 Marks)**

iv. Saving bonds only **(2 Marks)**

v. CD's only **(2 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)**

QUESTION FIVE (20 MARKS)

a) The first term of an arithmetic progression is -12, and the last term is 40. If the sum of the progression is 196, find the number of terms and the common difference. **(4 Marks)**

b) Solve the following pair of simultaneous inequalities and draw a number line.

$3 - x < 5, \quad 2x - 5 < 7$ **(5 Marks)**

c) A committee of ten is to be chosen from nine men and six women. In how many ways can it be formed if at least four women are to be in the committee? **(6 Marks)**

d) 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)**