



STRATHMORE INSTITUTE
DIPLOMA IN INTERNATIONAL RELATIONS
DIPLOMA IN BUSINESS MANAGEMENT
END OF SEMESTER EXAMINATION
DBM1203/DIR 1202: BUSINESS MATHEMATICS

DATE: 22nd August 2022

TIME: 2 Hours

INSTRUCTIONS:

- 1. ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.**
- 2. DO NOT WRITE ON THE QUESTION PAPER.**

QUESTION ONE (30 MARKS)

- a) i) Differentiate between a *series* and a *sequence* (2 marks)
- ii) The yearly depreciation of a certain machine is 25% of its value at the beginning of the year. If the original cost of the machine is \$20, 000, what is its value after 6 years? (4 marks)
- b) The resale value V of a piece of industrial equipment has been found to behave according to the function
- $$V = 250,000e^{-0.06t}$$
- where $t =$ years since original purchase. What is the expected resale value after 5 years (3 marks)
- c) Let $\Sigma = \{1,2,3,4,5,6,7,8,9\}$, $A = \{1,2,3,4\}$, $B = \{2,4,6,8\}$ and $C = \{3,4,5,6\}$. List the elements of the following sets.
- i. $A \cap B \cap C$ (2 marks)
- ii. $(A \cap B) \cap (A - B)$ (3 marks)
- d) Of 100 people, 60 invested in company A and 72 invested in company B. If 40 of the people invested in both companies, how many of the 100 invested in company A and did not invest in company B? (4 marks)

- e) Use Venn diagram to show

$$A \cup (B \cap C) = (A \cup B) \cap (A \cup C) \quad (6 \text{ marks})$$

- f) The profit function for a firm is $P(x) = -0.008x^2 + 400x - 150,000$ where x equals the number of units sold and P is the annual profit in dollars.
- What type of function is this? (1 mark)
 - What is the maximum profit? (5 marks)

QUESTION TWO (15 MARKS)

- a) A long run cost function for a firm in a competitive industry is given by the equation $C(q) = 50,000 + 10q + 0.03q^2$ where q represents output. The market demand for the product is given as $q = 1250 - 50p$ where p is the unit price of output in shillings.
- Find the expression for the profit function (4 marks)
 - Find the output that maximizes the profit and the maximum profit. (6 marks)
- b) A cookware manufacturer is preparing to market new machine. The company fixed costs are \$2,000 and a variable cost of are \$100 per machine. The company sales the past machine for \$600. Find the break-even point. (5 marks)

QUESTION THREE (15 MARKS)

- a) John started his employment with a salary of Sh. 120,000 per annum which was increased by Sh. 10,000 every year up to the top of the scale of Sh. 1,500,000 per annum.
- REQUIRED**
- In how many years' time does he reach to the top scale? (3 marks)
 - What is the total amount he would earn during this period (3 marks)
- b) Out of a group of 60 people, 20 invested in the stock market, 35 had certificates of deposit (CD's), and 34 had savings bonds. Furthermore, 23 had both CD's and bonds, 13 had both stocks and CD's, and 13 had both bonds and stocks. Finally, 10 of the people had no investments.
- Determine how many people had all three types of investments. (5 marks)
 - Use the value obtained in (i) to represent information in a Venn-diagram. (3 marks)
 - How many people invested in at most two investments? (1 mark)

QUESTION FOUR (15 MARKS)

a) Let $A = \begin{bmatrix} 1 & 2 \\ 0 & -3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix}$, evaluate $A^2 + 2AB + B^2$ (4 marks)

b) Solve the following system using inverse matrix method

$$2x + y - z = 3$$

$$3x - y - 2z = 4$$

$$x + y + z = 6$$

(6 marks)

c) A salesman earns a commission of 3% on sale of chairs and a commission of 4% on sale of Tables. The selling price of a chair and a table are sh 6000 and sh 15000 respectively. During the month of June 2005 the number of chairs the salesman sold were 10 units more than the number of tables sold. He received a total commission of sh 21,300. Determine the number of chairs and Tables the salesman sold in the month of June 2005.

(5 marks)

QUESTION FIVE (15 MARKS)

a) Given the matrix $A = \begin{bmatrix} x-5 & 3 \\ 2 & x \end{bmatrix}$, find the values of x for which the matrix A is a singular matrix. (4 marks)

b) A book seller buys 30 business finance and 25 management mathematics books at a total cost of Sh.18, 750 and 40 business finance and 60 management mathematics books at a total cost of Sh.37, 000. If the book seller makes a profit of 20% on each business finance book and 25% on each management mathematics book, find the total revenue realized in selling 20 business finance books and 30 management mathematics books. (4 marks)

c) Given the following sets

$$A = \{mandazi, kebabs, tea\} \quad B = \{smokies, mandazi, margarine, cake\}$$

$$C = \{bread, kebabs, margarine, cake\} \quad D = \{smokies, mandazi\}$$

Find:

i. $A \cup B$ (2 marks)

ii. $B \cap C$ (2 marks)

iii. $(A \cup C) \cap (B - C)$ (3 marks)