



STRATHMORE INSTITUTE
DIPLOMA IN BUSINESS CREATION AND ENTREPRENEURSHIP
DIPLOMA IN INTERNATIONAL RELATIONS
END OF SEMESTER EXAMINATION
DE1306; DIR 1202: BUSINESS MATHEMATICS

DATE: 11th April, 2024

Time: 10:30 – 12:30

Question 1 (30 marks) Compulsory

- a) Define the following terms:
- (i) Real numbers [2 marks]
 - (ii) Integers [2 marks]
 - (iii) Statistics [2 marks]
 - (iv) Range [2 marks]
- b) Expand; $(23x^2y^3 - 7y^3)(2 - 5x^3y^4)$ [2 marks]
- c) Factorize completely $8x^2 + 10x + 3$ [2 marks]
- d) Given the root $x = \frac{-5}{3}$ and $x = 2$ determine a corresponding quadratic equation of the form $ax^2 + bx + c = 0$ [2 marks]
- e) Solve for x if $P = \begin{pmatrix} 3 & -2 \\ 4 & x \end{pmatrix}$ is a singular matrix [2 marks]
- f) Wafula bought 3 ties and 4 shirts at *Ksh.* 2410 while Katana bought 4 ties and 3 shirts at *Ksh.* 2000. Find the cost of 5 shirts and 2 ties. [5 marks]
- g) Consider the data set 10,14,17, X, 31,44,43,41,32 and 30. Determine;
- (i) The value of X if the mean $\bar{X} = 29$ [2 marks]
 - (ii) The standard deviation [3 marks]
- h) Members of a chama decided to raise *Ksh.* 20000 towards charity. Five of them were unable to contribute. The rest had therefore to pay *Ksh.* 200 more each to realize the same amount. How many members were in the chama originally? [4 marks]

Question 2 (15 marks) - Optional

- a) Expand and simplify $4(2x + 3) - 3(5x - 6)$ [2 marks]
- b) Given that the lengths of three sides of a right- angled triangle are $x, x + 1$ and $x + 2$ metres. Find the area of the triangle. [5 marks]
- c) Solve the following system using CRAMER'S rule
- $$\begin{aligned} 2x + 3y - z &= 1 \\ 4x + y - 3z &= 11 \\ 3x - 2y + 5z &= 21 \end{aligned}$$
- [8 marks]

Question 3 (15 marks) - Optional

- a) Define the following terms. **[3 marks]**
- i. Null matrix
 - ii. Identity matrix
 - iii. Square matrix
- b) Given that matrix $A = \begin{bmatrix} -1 & -6 \\ 0 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -3 \\ 5 & -7 \end{bmatrix}$, find $A^T + AB + 2(A - B)$ **[4 marks]**
- c) Two matrices A and B are such that $A = \begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ Given that the determinant of $AB = 4$, find the value of k. **[3 marks]**
- d) Solve the following simultaneous equation using the inverse of a matrix method **[5 marks]**

$$5x - 2y = 16$$

$$7x + 6y = -4$$

Question 4 (15marks) - Optional

- a) A group of students attending a party were group into 3 sets; set A= {those who took Sodas}, set B = {those who took Coffee} and Set C = {those took Milk}. It was also realized that they were some people who did not take any of the 3 drinks i.e. Sodas, Coffee, or Milk. Represent the following sets in separate Venn diagrams by shading the appropriate region, assume that none of the sets is empty;
- i) $(A \cap C) \cap B^c$ **[1 mark]**
 - ii) $(A \cap C) \cup B^c$ **[2 marks]**
 - iii) Those who did not take soda or coffee or not juice $\neg(A \cup B \cup \bar{C})$ **[2 marks]**
- b) Pacho company is made up of 3 departments; F, R and P where F is for Finance, R for Research and P for Personnel departments. A survey was carried out to establish the number of employees in the company, and it was found out that; $n(F) = 10$; $n(R) = 12$; $n(P) = 20$; $n(F \cap R) = 7$; $n(R \cap P) = 6$, $n(F \cap P) = 4$ and $n(F \cap R \cap P) = 3$.
- i) Use a Venn diagram to represent the above information **[3 marks]**
 - ii) Determine how many employees worked in personnel or research **[2 marks]**
 - iii) Determine the total number of employees in the company **[2 marks]**
 - iv) Suppose you were the owner of the company and intend to lay off some workers, such that you are left with 12 employees only, and you intend to distribute them evenly over the 3 departments. Show this distribution with the aid of a Venn diagram **[3 marks]**

Question 5 (15marks) - Optional

In a survey of 50 salesman, it was noted that each sold between 140 and 200 buckets as shown below

187, 176, 158, 192, 159, 141, 150, 190, 175, 167,
 180, 181, 170, 173, 169, 161, 188, 146, 185, 197,
 150, 147, 181, 187, 175, 160, 165, 192, 177, 171,
 170, 174, 153, 143, 161, 189, 184, 183, 170, 146,
 180, 176, 178, 164, 169, 176, 178, 167, 174, 164

Use the data set above to;

- i. Construct a frequency distribution table for the grouped data starting with class: 140 – 149, 150 – 159, 160 – 169, ... **[2 marks]**
- ii. Calculate the mean for the above data **[4 marks]**
- iii. Calculate the variance of the above data **[4 marks]**
- iv. Plot a histogram and hence use it to estimate the mode **[5 marks]**