



Strathmore
UNIVERSITY

**STRATHMORE INSTITUTE
DIPLOMA IN INTERNATIONAL RELATIONS
DIPLOMA IN ENTREPRENEURSHIP
DIPLOMA IN JOURNALISM
DIPLOMA IN PROCUREMENT
END OF SEMESTER EXAMINATION
DIR 1106: BUSINESS MATHEMATICS
DE1306: BUSINESS MATHEMATICS
DJNM1106: BUSINESS MATHEMATICS
DPR1106: BUSINESS MATHEMATICS**

DATE: 14th August 2019

Time: 2 Hours

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.
3. Do not write on the question paper.

QUESTION ONE [30 MARKS]

- a) Distinguish between a finite set and infinite set as used in set theory, giving an example in each case. [4 Marks]
- b) A firm sells a product for *Sh.* 80 per unit .Raw material costs are *Sh.* 12.50 per unit , labor costs are *Sh.* 27.50 per unit , and annual fixed costs are *Sh.* 360,000 .
- (i) Determine the profit function $P(x)$, where x equals the number of units sold. [2 Marks]
 - (ii) How many units would have to be sold to earn an annual profit of *Sh.*250,000 ? [2 Marks]
- c) Solve the equation $\frac{2}{x+2} + \frac{3}{x+3} = 2$. [4 Marks]
- d) Let $P = \begin{bmatrix} 4 & -3 & 9 \\ -3 & -6 & 2 \end{bmatrix}$, $Q = \begin{bmatrix} -7 & 5 & 6 \\ 4 & -4 & -3 \end{bmatrix}$ and $R = \begin{bmatrix} -2 & 6 & -3 \\ 7 & -6 & 2 \end{bmatrix}$
Find $5P + 2Q - 4R$. [5 Marks]
- e) Let $U = \{1, 2, 3, \dots, 12\}$, $A = \{5, 6, 7, 8, 9\}$, $B = \{2, 3, 4, 5, 6, 7\}$, and $C = \{1, 2, 4, 6, 8, 10\}$. List the elements of the following set. Find:
- i. $A \cup B \cup C$ [2 Marks]
 - ii. $A \cap B \cap C$ [1 Mark]

- iii. $(A \cup B \cup C)^c$ [2 Marks]
 iv. $A \oplus B$ [2 Marks]

- f) The ratio of the fourth and sixth terms of a geometric progression is 4, and the sum of the first three is $\frac{21}{4}$. Determine the first term and common ratio. [4 Marks]

QUESTION TWO [15 MARKS]

- a) The sum of the first four terms of arithmetic progression is 4, and the difference between the eighth and fourth terms is 12. Determine the;
- (i) First term and common difference; [5 Marks]
 (ii) Sum of the first twenty-one terms. [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.
- (i) What was the original value of the piece of equipment? [3 Marks]
 (ii) What is the expected resale value after 5 years? [3 Marks]

QUESTION THREE [15 MARKS]

- a) Define the following types of matrices:

- (i) Row matrix [1 Mark]
 (ii) Identity matrix [1 Mark]
 (iii) Zero matrix [1 Mark]

- b) Solve the following linear equations using the matrix method:

$$\begin{aligned} 4a - 2b &= 6 \\ 3a + b &= 7 \end{aligned} \quad [4 \text{ Marks}]$$

- c) Hanna and Marcella appeared for an interview for two vacancies in the same post.

The probability of Hanna being selected is $\frac{3}{7}$ while the probability of Marcella being selected is $\frac{2}{5}$. Determine the probability that:

- (i) Both of them will be selected. [2 Marks]

- (ii) Only one of them will be selected. [3 Marks]
- (iii) None of them will be selected. [2 Marks]
- (iv) At least one of them will be selected. [2 Marks]

QUESTION FOUR [15 MARKS]

- a) The following data shows the marks obtained in a Mathematics examination in Strathmore Institute;

Marks	No. of Students
0 – 10	2
10 – 20	18
20 – 30	30
30 – 40	45
40 – 50	35
50 – 60	20
60 – 70	6
70 – 80	3

Determine:

- (i) The average of the marks [4 Marks]
- (ii) The median of the marks [3 Marks]
- (iii) The mode of the marks [3 Marks]
- (iv) The standard deviation of the marks [5 Marks]

QUESTION FIVE [15 MARKS]

- a) ABC company manufacturers make two products namely; X and Y . The cost of making 15 units of product X and 10 units of product Y is *Ksh.* 6,000. The cost of making 5 units of product X and 8 units of product Y is *Ksh.* 3,400. Find the cost of making one unit of product X and one unit of product Y . [4 Marks]
- b) A travel agent in Nairobi surveyed 100 people who had visited the cities of Mombasa and Kisumu. The results were as given below:
- 30 people had visited Mombasa.
 - 26 people had visited Kisumu.
 - 12 people had visited both Mombasa and Kisumu.

Required:

- (i) Present the above information in a Venn diagram. [3 Marks]
- (ii) The number of people who had visited Mombasa or Kisumu. [1 Mark]
- (iii) The number of people who had visited Kisumu but not Mombasa. [1 Mark]
- (iv) The number of people who had visited only one of the two cities. [1 Mark]
- (v) The number of people who had visited neither of the two cities. [1 Mark]

c) Simplify the expression $\frac{\log 27 - \frac{1}{2} \log 9}{\log 81 + \frac{1}{2} \log 9}$ [4 Marks]

END