QP CODE	2010551202

Reg. No | | | | | | | | | | |

DMI-ST. EUGENE UNIVERSITY

ZAMBIA

DEGREE EXAMINATION – JUNE 2024

Semester: I **055 MA 12 MATHEMATICS I**

Time: 3:00 Hours **Max. Marks: 100**

Answer any FIVE Questions (5 x 20 = 100 Marks)

1. a) Explain about any 4 types of sets. **(5 Marks)**

   b) Let $A = \{9, 10, 11, 12, 13\}$ and let $f: A \rightarrow \boldsymbol{N}$ be defined by $f(n) =$ the highest prime factor of n. Find the range of f. **(10 Marks)**

   c) Explain constant function. **(5 Marks)**

2. a) Differentiate Radian Measure and Degree Measure. **(5 Marks)**

   b) Explain: sine and cosine Curve. **(5 Marks)**

   c) Prove that

   i) $cot\ (x + y) = \frac{cot\ x\ cot\ y - 1}{cot\ y + cot x}$

   ii) $cot\ (x - y) = \frac{cot\ x\ cot\ y + 1}{cot\ y - cot x}$ **(10 Marks)**

3. a) Compute the derivative of $tan\ x$. **(5 Marks)**

   b) Find the derivative of f(x)=1/x. **(5 Marks)**

   c) Find the derivative of $x^{-4}(3 - 4x^{-5})$ (using Leibnitz Rule). **(10 Marks)**

4. a) Find the ratio in which the YZ-plane divides the line segment formed by joining the points (–2, 4, 7) and (3, –5, 8). **(10 Marks)**

   b) Find the distance between parallel lines

(i) $15x + 8y – 34 = 0$ and $15x + 8y + 31 = 0$

(ii) $l (x + y) + p = 0$ and $l (x + y) – r = 0$ **(10 Marks)**

5. a) Find the mean and variance of :

x:	6	10	14	18	24	28	30
f:	2	4	7	12	8	4	3

(10 Marks)

b) Find the mean deviation about the mean for the following data.

Income per day	Number of people
0-100	4
100-200	8
200-300	9
300-400	10
400-500	7
500-600	5
600-700	4
700-800	3

(10 Marks)

6. a) Describe the types of function with their graphs(any six). **(10 Marks)**

b) Let A = {1,2,3}, B = {3,4} and C = {4,5,6}. Find

(i) $A \times (B \cap C)$ (ii) $(A \times B) n (A \times C)$

(iii) $A \times (B \cup C)$ (iv) $(A \times B) \cup (A \times C)$ **(10 Marks)**

7. a) Find the derivative of $x2 – 2$ at $x = 10$. **(5 Marks)**

b) Find the derivative of $99x$ at $x = 100$. **(5 Marks)**

c) Find the derivative of

$f (x) = (5x3 + 3x –1)(x – 1)$. **(10 Marks)**