

ADMISSION NUMBER											

School of Basic Sciences

Master of Science in Mathematics
Mid Term Examination - Nov 2023

Duration : 90 Minutes
Max Marks : 50

Sem I - C1PM104T - Advanced Analysis

General Instructions

Answer to the specific question asked

Draw neat, labelled diagrams wherever necessary

Approved data hand books are allowed subject to verification by the Invigilator

- 1) Find the limit points of $(0,3]$. K2 (2)
- 2) Explain an arbitrary union of open sets is open set, and a finite intersection of open sets is open set. K1 (3)
- 3) Show that a convergent sequence is Cauchy sequence, and a Cauchy sequence is bounded. K2 (4)
- 4) What is an isometry check the following map $F: \mathbb{R} \rightarrow \mathbb{R}$ defined as $F(x)=x+5$ is an isometry K2 (6)
- 5) Classify the following sets as compact or not a) $(0,1)$ b) $[0,1] \cup [3,4]$ K3 (6)
c) \mathbb{R}
- 6) Determine all first and second order partial derivatives of $f(x,y)=x^2y^3 + 2xy - 5y$. K3 (9)
- 7) If d_1, d_2 are two metrics on the set X , then which of the following forms a metric on X give the explanation: K4 (8)
(i) $d_1 + d_2$.
(ii) $\max(d_1, d_2)$
(iii) $\min(d_1, d_2)$
- 8) Find the total derivative of function $f: \mathbb{R}^2 \rightarrow \mathbb{R}^3$ defined as $f(x,y)=(2x+y, x-3y, xy)$ at $(1,2)$ as a linear transformation. K4 (12)

OR

Find the partial derivatives $\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial^2 f}{\partial x^2}, \frac{\partial^2 f}{\partial y^2}$ Of $f(x,y)=x^3 + y^3 + 2$ K4 (12)