

**School of Basic Sciences**

Master of Science in Mathematics  
Mid Term Examination - May 2024

Duration : 90 Minutes  
Max Marks : 50

**Sem II - C1PM202T - General Topology**

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) Define a compact space in the topology K2 (2)
- 2) State the base and subbase of a topological space. K1 (3)
- 3) State the continuous function and second countable space with a suitable example. K2 (4)
- 4) Define the following in a topological space K2 (6)
  - (i) Co-finite topology
  - (ii) Usual topology
  - (iii) Indiscrete topology
  - (iv) Co-countable topology
  - (v) Lower limit topology
  - (vi) Upper limit topology
- 5) Let  $\tau$  be the collection of subsets of  $\mathbb{N}$  consisting of empty set  $\emptyset$  and all subsets of the form  $G_m = \{m, m + 1, m + 2, \dots\}, m \in \mathbb{N}$ . Show that  $\tau$  is topology of  $\mathbb{N}$ , and construct all open sets containing 15. K3 (6)
- 6) Let  $X$  and  $Y$  be two topological spaces. A mapping  $f: X \rightarrow Y$  is continuous if and only if the inverse image under  $f$  of every closed set in  $Y$  is open in  $X$ . K3 (9)
- 7) Let  $X$  and  $Y$  be two topological spaces. A mapping  $f: X \rightarrow Y$  is continuous if and only if  $f^{-1}[\overline{B}] \subset \overline{f^{-1}[B]}$  for every  $B \subset Y$ . K4 (8)
- 8) Let  $X$  and  $Y$  be two topological spaces. A mapping  $f: X \rightarrow Y$  is continuous if and only if  $f^{-1}[\overline{B}] \subset \overline{f^{-1}[B]}$  for every  $B \subset Y$  K4 (12)

**OR**

Let  $X$  and  $Y$  be two topological spaces. A mapping  $f: X \rightarrow Y$  is continuous if and only if  $f(\overline{A}) \subset \overline{f(A)}$  for every  $A \subset X$ . K4 (12)