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Roll No.

MAMT-02

Real Analysis and Topology

MA/M.Sc. Mathematics (MAMT/MSCMT)

1st Year Examination, 2023 (June)

Time : 2 Hours]

Max. Marks : 70

Note : This paper is of Seventy (70) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein. Candidates should limit their answer to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

SECTION–A

(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nineteen (19) marks each. Learners are required to answer any Two (02) questions only.

(2×19=38)

1. If the orthonormal system (i) is closed and if f and g belong to L_2 .
2. Prove that L^p space is a linear space.
3. Let $\tau = \{\emptyset, X, \{1\}, \{1,2\}, \{1,2,5\}, \{1,2,3,4\}, \{1,3,4\}\}$ be the topology on $X = \{1,2,3,4,5\}$. Determine limit points, closure, interior, exterior and boundary of the following sets :
 - (a) $A = \{3,4,5\}$.
 - (b) $B = \{2\}$.
4. Prove that L_2 is complete space.
5. Prove that A T_4 -Space is a T_3 -Space.

SECTION-B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Eight (08) marks each. Learners are required to answer any Four (04) questions only. (4×8=32)

1. If E is a set such that $m^*(E) = 0$, then prove that E is measurable.
2. Prove that L_2 is a normal linear space.

3. Let $X = \{0, 1, 2\}$ $\tau = \{\emptyset, X, \{0\}, \{0, 1\}\}$

Let f be a continuous map of X into itself such that $f(1) = 0$ and $f(2) = 1$, what is $f(0) = ?$

4. Prove that every metric space is normal space.

5. Show that a closed subset of a compact space is compact.

6. Show that a subset A of topological space X is open iff $A^0 = A$.

7. Show that a topological (X, τ) is T_1 -space iff $\{x\}$ is closed?
 $x \in X$.

8. Define the following :

(a) σ - Algebra.

(b) Measurable Function.

(c) Limit point.

(d) Derived set.



