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M.A./M.Sc. Ist Semester (Reg./Pvt./ATKT) Examination, 2019

Maths

Paper - III

Topology-I

Time : 3 Hours] **[Maximum Marks : Reg.= 85, Pvt.= 100**

Note :- Attempt all the questions.

SECTION - 'A'

Objective Type Questions **5×2=10**

1. Choose the correct answer :

(i) The set of all irrational numbers is

(a) Countable

(b) Uncountable

(c) Finite

(d) None of these

(ii) Boundary of set of all integers I is

(a) N

(b) R

(c) Q

(d) R^+

(iii) Which of the following is true:

(a) $\overline{A} = A \cup D(A)$

(b) $\overline{A} = A \cap D(A)$

(c) $A = \overline{A} \cup D(A)$

(d) $A = \overline{A} \cap D(A)$

(iv) Every indiscrete space is

(a) Connected

(b) Disconnected

(c) Totally disconnected

(d) None of these

(v) Every lindelof's metric space is

(a) Compact

(b) Second countable

(c) First countable

(d) None of these

SECTION - 'B'

Short Answer Type Questions **5×5=25**

2. Prove that set of all integers is countable.

OR

Write the statements of continuum hypothesis and Zorn's lemma.

OR

3. Define closed set is a tolpological space with an example.

OR

Define base of a topological space with an example.

4. Define continuous function in a toplogical space with an example.

OR

Define homeomorphism in a topological space with an example.

5. Show that every metric space in first countable.

OR

Define separability with an example

6. Prove that continuous image of connected space is connected.

OR

Prove that every component of locally connected space is open.

SECTION - 'C'

Long Answer Type Questions **5×10=50**

7. State and prove schroedir Bernstein theorem.

OR

Prove that each set can be well ordered.

8. Let A and B be subset of a topological space X. Then prove that

(i) $A \subset \overline{A}$

(ii) $A \subset B = \overline{A} \subset \overline{B}$

(iii) $\overline{A \cup B} = \overline{A} \subset \overline{B}$

(iv) $\overline{\overline{A}} = \overline{A}$

OR

Let (X J) be a topological space. Then prove that

(i) ϕ is closed set

(ii) Finite union of closed sets in closed.

(iii) Arbitrary intersection of open sets is open.

9. Define topological space in terms of kuratowski closure.

OR

Prove that a toplogical space X into another topological space Y is continuous if and only if for every BCY, $\overline{f^{-1}(B)} \subset f^{-1}\left(\overline{B}\right)$

10. Prove that every second countable space is first countable.

OR

Prove that every second countable space is separable.

11. In a topological space, prove that a set is disconnected if and only if it is union of two non empty separated sets.

OR

Prove that a toplogical space x is locally connected if and only if component of every open subspace of x is open in x.

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