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2022

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

[P.G.]

(M.Sc. Second Semester End Examination-2022)

PAPER-MTM 206

[General Topology]

Full Marks: 25 *Time: 01 Hr.*

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

1. Answer any two questions: $2 \times 2 = 4$

i) Define Hausdorff space with an example.

ii) Prove that the lower limit topology on R is strictly finer than the standard topology on R

iii) Is the space $\mathbb{R}_l$ connected? Justify your answer.

iv) Show that if Y be a subspace of X and A is a subset of Y. Then topology A inherits a subset of Y is the same as the topology it inherits as a subspace of X.

2. Answer any two questions: $8 \times 2 = 16$

(a) i) Let X be a topological space and B is a basis for X. A set χ is define by $\chi = \{U \subseteq X$: for each $x \in U$ there exist

$B \in \mathrm{B}$ such that $X \in B \subset U\}$. Show that χ is a topology on X

ii) Let Y be a subspace of X and A be a subset of Y Let $\bar{A} = cl(A)$, then show that $cl_Y(A) = cl_X(A) \cap Y$ 5+3

(b) i) Let X and Y are Hausdorff space. Then show that $X \times Y$ is also a Hausdorff space.

ii) Let $f : Z \to X \times Y$ be given by the equation $f(z) = (f_1(z), f_2(z))$. Then prove that f is continuous iff the function $f_1 : Z \to X$ and $f_2 : Z \to Y$ are continuous. The maps f_1 and f_2 are called coordinate function of f. 5+3

(c) i) Assume that $\mathbb{R}$ is uncountable. Show that if A is a countable subset of $\mathbb{R}^2$, Than $\mathbb{R}^2 - A$ is path connected.

ii) If $A \subset X$, a retraction of X onto A is a continuous map $r : X \to A$ such that $r(a) = a$ each $a \in A$. Show that a retraction is a quotient map.

[Internal Assssment-5]