No.	:	
	No.	No. :

Total No. of Questions: 11 ]

[ Total No. of Printed Pages : 3

## APF-2173

## M.A./M.Sc. (Final) Examination, 2022 MATHEMATICS

Paper - Opt. VI

(Topology)

Time: 3 Hours [ Maximum Marks: 100

Section-A (Marks :  $2 \times 10 = 20$ )

Note: Answer all ten questions (Answer limit 50 words). Each question carries2 marks.

Section–B (Marks :  $4 \times 5 = 20$ )

Note: Answer all five questions. Each question has internal choice (Answer limit200 words). Each question carries 4 marks.

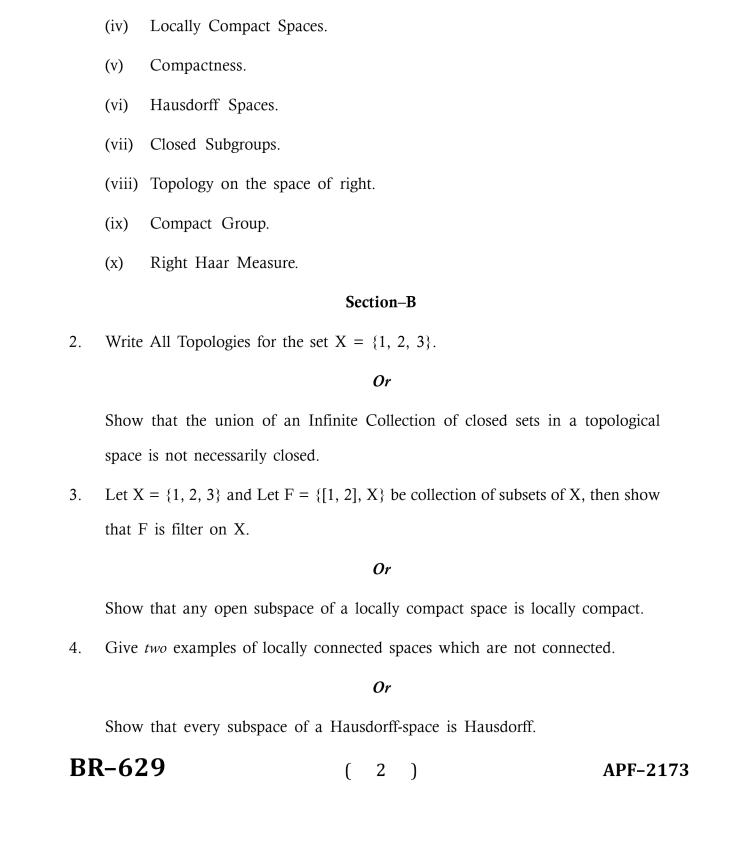
Section–C (Marks :  $20 \times 3 = 60$ )

**Note**:— Answer any *three* questions out of five (Answer limit **500** words). Each question carries **20** marks.

## Section-A

- 1. Define the following:
  - (i) Topological Spaces.

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(ii)

(iii)

Homeomorphism Bases.

Complete Metric Spaces.

5. Let  $X = \{a, b, c\}$  and  $T = \{\phi, [a], [b, c], [X]\}$ , then show that (X, T) is regular space but not  $T_2$ ,

Or

Define Topological group. Prove that a  $T_0$  topological group is a Tychonoff space.

6. Write short note for compact group.

Or

Show that every locally compact group admits a Left Haar Measure.

## Section-C

- 7. Let (X, T) and (Y, V) be two topological spaces and let *f* be a one-one onto mapping of X on to Y. Then the following statements are equivalent:
  - (i) f is open and continuous
  - (ii) f is a Homomorphism
  - (iii) f is closed and continuous
- 8. Prove that a topological space X is normal iff for any closed set F and open Set G containing F, then exists an open set  $G^*$  such that :  $F \subseteq G^*$  and  $\overline{G}^* \subseteq G$ .
- 9. If  $f: X \to Y$  is continuous and Y is Hausdorff, then  $A = \{(x, y) : f(x) = f(y)\}$  is a closed subset of XxX.
- 10. Prove that regular space is a topological property.
- 11. Explain existence and uniqueness of Left Haar Measure.