

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN  
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)  
Chromepet, Chennai — 600 044.

M.Sc. - END SEMESTER EXAMINATIONS APRIL - 2022

SEMESTER - II

14PAMCT2A05 & PAM/CT/2A05 - Topology

Total Duration : 3 Hrs.

Total Marks : 60

**Section A**

Answer any **SIX** questions ( $6 \times 5 = 30$  Marks)

1. If  $f$  and  $g$  are continuous real functions defined on a metric space  $X$ , then prove that  $f+g$  and  $\alpha f$  are also continuous,  $\alpha$  is any real number.
2. Let  $X$  be a second countable space. Prove that any open base for  $X$  has countable subclass which is also an open base.
3. Prove that any sequentially compact metric space is totally bounded.
4. Prove that every compact Hausdroff space is normal.
5. Prove that the components of a totally disconnected space are its points.
6. Let  $X$  be a topological space and  $A$  a subset of  $X$ . Then prove that
  - (a)  $\bar{A} = A \cup D(A)$
  - (b)  $A$  is closed if and only if  $A \supseteq D(A)$ .
7. State and prove Lindelof's theorem.
8. Let  $X$  be a topological space and  $A$  be a subset of  $X$ . Then prove that  $\bar{A} = \{x: \text{Each neighbourhood of } x \text{ intersects } A\}$

**Section B**

**Part A**

Answer any **TWO** questions ( $2 \times 10 = 20$  Marks)

9. Let  $X$  and  $Y$  be metric spaces and  $f$  a mapping of  $X$  into  $Y$ . Prove that  $f$  is continuous at  $x_0$ , if and only if  $x_n \rightarrow x_0 \Rightarrow f(x_n) \rightarrow f(x_0)$ .
10. Prove that every separable metric space is second countable.
11. State and prove Tychonoff's Theorem.
12. State and prove Urysohn's Lemma.

**Part B**

Compulsory question ( $1 \times 10 = 10$  Marks)

13. Prove that a subspace of a real line  $R$  is connected if and only if it is an interval.

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