Enrollment No: _____   Exam Seat No:_____

C.U.SHAH UNIVERSITY
Summer Examination-2019

Subject Name : Topology
Subject Code : 5SC01TOP1   **Branch : M.Sc. (Mathematics)**
Semester : 1   Date : 19/03/2019   Time : 2:30 To 5:30   Marks : 70
Instructions:
   (1) Use of Programmable calculator & any other electronic instrument is prohibited.
   (2) Instructions written on main answer book are strictly to be obeyed.
   (3) Draw neat diagrams and figures (if necessary) at right places.
   (4) Assume suitable data if needed.

SECTION – I

Q-1	**Attempt the Following questions**	**(07)**
a.	Define : Co-finite topology.	**(01)**
b.	What do you mean by countable set?	**(02)**
c.	Write a difference between metric space and topological space .	**(02)**
d.	What do mean by hereditary property?	**(02)**

Q-2	**Attempt all questions**	**(14)**
a.	Define :Co-countable topology	**(02)**
b.	If X={ a , b , c , d , e } and τ ={ $\emptyset$, X , {a} ,{b},{c},{a , b},{a , c},{b , c},{a , b , c} },then show that (X , τ) is topological space. Also write all the τ -closed subsets of X .	**(06)**
c.	What do you mean by τ –closed sets ? show that arbitrary intersection of τ –closed sets is τ –closed.	**(06)**

OR

Q-2	**Attempt all questions**	**(14)**
a.	Define :Metric topology	**(02)**
b.	What do you mean by subspace topology ? If $Y = [-2,2)$ is a subspace of R. Check whether the set $A = \{x/0 < |x| < 1\}$ is open in Y.	**(06)**
c.	Define closure of a set. Let A be a subset of topological space X and $A^{'}$ be the set of all limit points of A. Then prove that $\overline{A} = A \cup A^{'}$.	**(06)**

Q-3	**Attempt all questions**	**(14)**
a.	Define :T_2 Space.	**(02)**
b.	State and prove pasting Lemma.	**(06)**
c.	Let X and Y be topological spaces and f: X $\rightarrow$ Y then prove that following are equivalent (i) f is continuous.	**(06)**

(ii) For every subset A of X, $f(\overline{A}) \subseteq \overline{f(A)}$.

(iii) For every closed set B of Y, the set $f^{-1}(B)$ is closed in X

<div align="center">OR</div>

Q-3		**Attempt all questions**	**(14)**
	a.	Define : limit point of set.	**(02)**
	b.	Prove that product of T_2 space is a T_2 space.	**(06)**
	c.	What is uniform convergence of sequence of functions also give one example of sequence which is convergence but not uniform convergence.	**(06)**

<div align="center">SECTION – II</div>

Q-4		**Attempt the Following questions**	**(07)**
	a.	What do you mean by path connected set?	**(01)**
	b.	Define : Continuous function.	**(02)**
	c.	What is closure of Q in usual topology on R ?	**(02)**
	d.	Every T_1 space is T_0 Space , justify the statement.	**(02)**

Q-5		**Attempt all questions**	**(14)**
	a.	Describe Connected space.	**(02)**
	b.	What do you mean by topological property ? Prove that connectedness is topological property.	**(06)**
	c.	Prove that every path connected set is connected.	**(06)**

<div align="center">OR</div>

Q-5		**Attempt all questions**	**(14)**
	a.	State Tychonoff theorem.	**(02)**
	b.	Prove that closed subspace of a locally compact space is locally compact.	**(06)**
	c.	Prove that every compact T_2 space is normal.	**(06)**

Q-6		**Attempt all questions**	**(14)**
	a.	State Urysohn's lemma.	**(02)**
	b.	Prove that every compact subspace of T_2 space is closed.	**(06)**
	c.	What do you mean by bounded set ? Show that every compact subspace of a metric space is bounded.	**(06)**

<div align="center">OR</div>

Q-6		**Attempt all Questions**	**(14)**
	a.	Define: Compact space.	**(02)**
	b.	State and prove Heien-borel theorem.	**(06)**
	c.	Prove that continuous image of a compact space is compact.	**(06)**