P R E F A C E

In mathematics, general topology or point-set topology is a branch of topology which studies the properties of topological spaces and structures defined on them. The present study is on general topological spaces and fuzzy topological spaces. It consists of seven chapters. The first chapter deals with the $g\delta s$ continuous function in topological spaces. The second chapter is about contra $g\delta s$ continuous functions. The third chapter deals with almost contra $g\delta s$ continuous functions in topological spaces. The fourth chapter deals with totally $g\delta s$ continuous functions. The fifth chapter deals with weakly Urysohn topological spaces. The sixth chapter is about generalized ($g^*$) compactness in topological spaces and the last chapter is about $g^*$ pre continuous maps in fuzzy topological spaces.

In the first chapter, a new class of functions called $g\delta s$-continuous functions is introduced and studied. It is shown that every continuous function is $g\delta s$-continuous but not conversely and a function $f : X \rightarrow Y$ is $g\delta s$-continuous, if and only if for each point $x$ of $X$ and each open set $V$ in $Y$ containing $f(x)$, there is a $g\delta s$-open set $U$ in $X$ such that $x \in U$ and $f(U) \subseteq V$. A function is said to be semi-$g\delta s$-continuous, if the inverse image of every semiclosed set is $g\delta s$-closed set. Every irresolute function is semi-$g\delta s$-continuous and every semi-$g\delta s$-continuous function
is \( g_{\delta}s \)-continuous but not conversely. Among many other results, it is observed that the composition of two \( g_{\delta}s \)-continuous (resp. semi-\( g_{\delta}s \)-continuous) functions need not be a \( g_{\delta}s \)-continuous (resp. semi-\( g_{\delta}s \)-continuous) function. A function is called \( g_{\delta}s \)-irresolute, if the inverse image of each \( g_{\delta}s \)-closed set is \( g_{\delta}s \)-closed. It is shown that irresolute functions and \( g_{\delta}s \)-irresolute functions are independent of each other and every \( g_{\delta}s \)-irresolute function is \( g_{\delta}s \)-continuous but the converse need not be true in general. Also it is shown that the composition of two \( g_{\delta}s \)-irresolute functions is \( g_{\delta}s \)-irresolute.

In the second chapter, a new class of functions called contra \( g_{\delta}s \)-continuous function is introduced and studied. It is proved that a function \( f : X \rightarrow Y \) is contra \( g_{\delta}s \)-continuous if and only if for each \( x \in X \) and each closed set \( F \) of \( Y \) containing \( f(x) \), there exists \( g_{\delta}s \)-open \( U \) containing \( x \) such that \( f(U) \subseteq F \). It is shown that if a function \( f \) is contra \( g_{\delta}s \)-continuous, then \( f \) is weakly \( g_{\delta}s \)-continuous function and if \( f \) is surjective \( g_{\delta}s \)-open (or \( g_{\delta}s \)-closed) and \( g \) is a function such that \( g \circ f \) is contra \( g_{\delta}s \)-continuous, then \( g \) is contra \( g_{\delta}s \)-continuous.

In the third chapter, almost contra \( g_{\delta}s \)-continuous functions are introduced and studied. It is proved that a function \( f : X \rightarrow Y \) is almost contra \( g_{\delta}s \)-continuous if and only if for each \( x \in X \) and each regular closed set \( F \) of \( Y \) containing \( f(x) \), there exists \( g_{\delta}s \)-open set \( U \).
containing \( x \) such that \( f(U) \subseteq F \).

The graph \( G(f) \) of a function \( f : X \rightarrow Y \) is said to be contra \( g\delta s \)-closed if for each \( (x, y) \in (X \times Y) \setminus G(f) \), there exist \( U \in G\delta SO(X, x) \) and \( V \in C(Y, y) \) such that \( (U \times V) \cap G(f) = \emptyset \). It is proved that, if \( f : X \rightarrow Y \) is contra \( g\delta s \)-continuous and \( Y \) is Urysohn, then \( G(f) \) contra \( g\delta s \)-closed in \( X \times Y \) and if \( f : X \rightarrow Y \) is almost weakly \( g\delta s \)-continuous and \( Y \) is Urysohn, then \( G(f) \) is strongly contra \( g\delta s \)-closed in \( X \times Y \).

In the fourth chapter, we study the concept of a new class of functions called totally \( g\delta s \)-continuous functions and obtain some of their properties. It is proved that a function \( f : X \rightarrow Y \) is totally \( g\delta s \)-continuous at a point \( x \in X \) if for each open subset \( V \) in \( Y \) containing \( f(x) \), there exists a \( g\delta s \)-clopen subset \( U \) in \( X \) containing \( x \) such that \( f(U) \subseteq V \). It is proved that totally \( g\delta s \)-continuity and strongly \( g\delta s \)-continuity are independent of each other and every totally \( g\delta s \)-continuous function is \( g\delta s \)-continuous. It is observed that the set of all points \( x \) of \( X \) at which \( f : X \rightarrow Y \) is not continuous is identical with the union of \( g\delta s \)-frontier of the inverse images of closed sets of \( Y \) containing \( f(x) \).

In the fifth chapter, we study the weakly Urysohn spaces. A topological space \( X \) is said to be weakly Urysohn if for each \( x, y \) in...
$X$ with distinct closures there are neighbourhoods $U$ and $V$ of $x$ and $y$ respectively such that the closures of $U$ and $V$ are disjoint. In this chapter a characterization of $R_0$-spaces is given. It is noticed that a regular $R_0$-space is weakly Urysohn and a weakly Urysohn space is $R_1$.

In the sixth chapter, we introduce and study the $g^*$ compactness in topological spaces. The study of generalized closed (g-closed) sets in a topological space was initiated by Levine and concept of $T_{1/2}$ spaces was introduced. Dunham further investigated the properties of $T_{1/2}$ spaces and defined a new closure operator $cl^*$ by using generalized closed sets. Levine introduced the concept of semi open sets and semi continuity in topological spaces. Bhattacharya and Lahiri introduced a new class of semi generalized open sets by means of semi open sets introduced by Levine. Balachandran, et.al., introduced the concept of generalized continuous maps, generalized homeomorphism in topological spaces.

In section 3, we shall introduce a new class of open sets namely $g^*$-open sets and investigate some of their properties. In section 4, we introduce the concept of $g^*$-continuous maps which includes the class of continuous maps in topological spaces. Also we introduce $g^*$-irresolute maps in analogy with irresolute maps in topological spaces and investigate some of their properties. The last section, deals with a new class
of maps namely g*-compactness in topological spaces and study some of their properties.

In the seventh chapter, a new class of sets called g*-preclosed fuzzy sets in fuzzy topological spaces are introduced and studied, which properly lies between the class of preclosed fuzzy sets and the class of generalized preclosed fuzzy sets and also we introduce and study a new class of spaces, namely fuzzy $T_p^*$-spaces and fuzzy $*T_p$-spaces as an application. Further, we introduce fuzzy $g^p$-continuous, fuzzy $g^p$-irresolute mappings, fuzzy $g^p$-closed maps and fuzzy $g^p$-open maps in fuzzy topological spaces. Some of their properties have been investigated.

The concept of fuzzy sets and fuzzy set operations were first introduced by L. A. Zadeh in his classical paper in the year 1965. Subsequently several researchers have worked on various basic concepts from general topology using fuzzy sets and developed the theory of fuzzy topological spaces. The notion of fuzzy sets naturally plays a very significant role in the study of fuzzy topology introduced by C. L. Chang. N. Levine introduced the concept of generalized closed sets in general topology in the year 1970.

K. Balasubramanian and P. Sundaram introduced and studied fuzzy generalized closed sets in fuzzy topology. T. Fukutake, R.K.
Saraf, M. Caldas and S. Mishra introduced generalized pre-closed fuzzy (briefly gp-closed) sets in fuzzy topological space. In 2002, g*p-closed sets, g*p-continuous, g*p-irresolute, g*p-closed, g*p-open maps and $T_p^*$, $*T_p$-spaces were introduced and studied by M.K.R.S. Veerakumar for general topology. In this section, we introduce a new class of sets called g*-preclosed fuzzy sets in fuzzy topological spaces which properly fits between the class of preclosed fuzzy sets and the class of generalized preclosed fuzzy sets and also we study and characterize g*p-closed fuzzy sets and associated functions, by introducing and characterizing fg*p-continuous and fg*p-irresolute mappings.