Recent Advances in Mathematics and Optimization

Prof. Avanish Kumar

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Contents

2

On Some New Operations in Interval-Valued Intuitionistic Fuzzy Soft Sets

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ABSTRACT

The soft set theory plays a key role for dealing with uncertainty, fuzziness and vagueness. The concept of fuzzy soft set which can be seen as a new mathematical approach to vagueness is used in many applications including reliability analysis, decision making and medical diagnosis problems. Later, it is generalized to an interval-valued intuitionistic fuzzy soft set. In this paper we present the definition and operations of an interval-valued intuitionistic fuzzy soft set. Furthermore, based on the analysis of several operations on interval-valued intuitionistic fuzzy soft set in the study, we provide some new notions such as the restricted intersection and restricted union of two interval-valued intuitionistic fuzzy soft sets. We also prove De Morgan's laws hold in interval-valued intuitionistic fuzzy soft set with respect to the new definitions.
Keywords – Interval-valued intuitionistic fuzzy soft set, Intuitionistic fuzzy soft set, Restricted intersection, Restricted union, Soft set

1. INTRODUCTION

Initially, for managing imprecise and vague information, Zadeh [7] introduced fuzzy set theory where vagueness is reflected by the membership degree of the objects belonging to a concept. After that an intuitionistic fuzzy set was introduced by Atanassov [4], which allow to incorporate simultaneously the membership degree and the non-membership degree of each element.

On other hand Molodtsov initiated the concept of soft set theory, which can be used as an important mathematical tool for dealing with uncertainty. Soft set theory is different from many traditional tools for dealing with uncertainties, such as the theory of fuzzy sets [7], the theory of intuitionistic fuzzy sets [4,5] and the theory of rough sets [21], is that it is free from the inadequacy of the parameterization tools of those theories [16].

The concept and basic properties of soft set theory are presented in [2]. Based on the analysis of several operations on soft sets introduced in [11], Ali et al. [9] present some new algebraic operations for soft sets and prove that certain De Morgan's laws hold in soft set theory with respect to these new definitions. It has been demonstrated that soft set theory brings about a rich potential for applications in many fields such as function smoothness, Reliability theory, Riemann integration, decision making, measurement theory, game theory, etc. [15].

Maji et al [10, 11] made a theoretical study on the soft set theory in more detail and contributed towards the fuzzification of the notion of it and described the application of soft set theory to a decision making problem using rough sets. Recently Kong et al. [19, 20] applied the soft set theoretic approach in decision making problems. Soft fuzzy set was defined by Yao et al. [1] followed by intuitionistic fuzzy soft set defined by Xu Yong et al.[18]. Alkhazaleh et al. [13] introduced the concept of fuzzy parameterized interval-valued fuzzy soft set and gave its application in decision making. Alkhazaleh et al. [14] introduced soft multisets as a generalization of Molodtsov's soft set and proposed the concept of possibility fuzzy soft set. Maji et al. [10, 12] presented the notion of the

Fixed Points of Asymptotically Regular Mappings on Partial b-metric Spaces

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ABSTRACT

Abstract – Recently, J .Gorniki [Remark on asymptotic regularity and fixed points, J.Fixed Point Theory Appl.,(2019)] established fixed point theorem for a new type condition in complete metric spaces. In this paper, we have obtained a fixed point result in partial b-metric spaces which extends the Gornicki's theorem in partial b-metric settings.

Keywords –Fixed point; Partial b-metric Spaces; Asymptotically Regular Mappings.

1. INTRODUCTION

Matthews [7] introduced the notion of partial metric space as a part of study of denotational semantics of data flow network. Bakhtin [2] and Czerwik [6] introduced b-metric space as a generalization of metric spaces. Recently, Sukala [10] generalizes both the concepts of b-metric space and partial metric space by introducing the concept of partial b-metric space. Moreover, Banach ,Kannan and other fixed point theorems of metric spaces are also extended to partial b-metric spaces and others by several researchers, see [1,4,9-11, 13] and references therein.

Throughout this paper the letters $\mathbb{N}, \mathbb{R}$ and $\mathbb{R}^+$ stand for set of positive integers, set of reals and set of non-negative reals, respectively. Now, we recall some important definitions and Preliminaries related to b-metric, partial metric and partial b-metric space (for more details, one may see [1,4,6,7,9-13]] and references therein.

2. PRELIMINARIES

Definition 2.1: ([7]). Let X be a non-empty set and the mapping $p: X \times X \to \mathbb{R}^+$
Be such that for all $x, y, z \in X$, the followings are satisfied:
(P1) $p(x,x) = p(y,y) = p(x,y) \Leftrightarrow x = y$:
(P2) $p(x,y) \leq p(y,x)$;
(P3) $p(x,y) = p(y,x)$;
(P4) $p(x,y) \leq p(x,z) + p(z,y) - p(z,z)$:
Then p is said to be a partial metric on X, and the pair (X,p) is called partial metric space.