Chapter 9

Summary and future research works

9.1 Summary of the thesis

In this thesis, some developments of soft set theory under different uncertain environments including fuzzy, intuitionistic fuzzy, linguistic, complex fuzzy, complex neutrosophic, etc. have been performed towards the both of theoretical and practical aspects. Further, we have solved different types of real-life related problems in different fields such as, medical diagnosis, suppler selection, manager selection, etc. by using soft set theory.

In Chapter 2, we have established a methodological approach for solving fuzzy soft set based group decision-making problems with the help of fuzzy distance and fuzzy soft distance. In this approach, firstly, we have measured the comprehensive consensus of a decision maker about an alternative in a fuzzy soft set based group decision-making. Secondly, we have provided some suggestions to a decision maker, who have less comprehensive consensus than the considered threshold value, so that he/she can reformulate his/her primary opinion about the alternative to increase his/her comprehensive consensus level up to the considered threshold value. After that, we have selected the best decision solution. Moreover, we have solved a sustainable supplier selection problem of a textile industry by using our proposed approach.

In Chapter 3, we have introduced the idea of order of an element of a fuzzy soft group. Then, we have proposed the idea of fuzzy soft cyclic group by combining the idea of soft cyclic group with fuzzy set. In this chapter it has been shown that, intersection of two fuzzy soft cyclic groups is a fuzzy soft cyclic group. Moreover, we have also shown that, union of two fuzzy soft cyclic groups will from a fuzzy soft cyclic group under some certain conditions. Some examples have also been discussed in this chapter to justify the existence

of our proposed definitions and theorems.

In Chapter 4, we have developed a decision-making approach for solving group decision-making problems with linguistic information based on the soft set theory through linguistic scale function. Further, we have clarified our methodology by a real-life-related problem regarding the plant location selection of a manufacturing company. The effectiveness of our proposed approach has also been illustrated. Moreover, we have pointed out that, linguistic scale function based operational laws are more useful for solving linguistic valued soft set based group decision-making problems.

In Chapter 5, we have introduced the notion of generalized trapezoidal intuitionistic fuzzy soft set (GTrIFSS) where, the evaluation of an object over a parameter is in terms of generalized trapezoidal intuitionistic fuzzy number. Then, we have defined the hamming distance for two generalized trapezoidal intuitionistic fuzzy soft sets. After that, a decision-making algorithm has been proposed to solve generalized trapezoidal intuitionistic fuzzy soft set based decision making problems in risk analysis with all linguistic information intuitively. Moreover, we have solved a risk assessment problem through our proposed generalized trapezoidal intuitionistic fuzzy soft set.

In Chapter 6, we have offered a new uncertain controlling tool to handle stochastic multi-criteria decision making problems. In this regard, we have proposed the concept of trapezoidal interval type-2 fuzzy soft stochastic set (TrIT2FSSS). Further, a new decision making methodology has been developed to solve stochastic multi-criteria decision making (SMCDM) problems by using our proposed trapezoidal interval type-2 fuzzy soft stochastic set.

Chapter 7 proposes a methodological approach for solving decision-making by using complex fuzzy soft set theory. In this regard, a new ratio similarity measure approach has been introduced for complex fuzzy soft sets to derive the similarity degree of two complex fuzzy soft sets. Moreover, we have introduced the idea of complex fuzzy soft weighted geometric mean aggregation operator to aggregate multiple complex fuzzy soft sets. Further, our proposed methodological approach has been used in a disease diagnosis decision-making problem.

In Chapter 8, a decision-making approach has been proposed by using VIKOR method through complex neutrosophic soft set. Some operations and properties on complex neutrosophic sets and complex neutrosophic soft sets have been defined. In addition, we have defined the score function of a complex neutrosophic number to transform it into a real value in the interval $[0, 1]$. Besides, in this chapter, some real-life based decision-making problems have been illustrated by using our proposed approach.

9.2 Future research scope

Soft set theory is a modern mathematical notion for handling uncertainty with the help of parameterization. In this thesis, some of its developments have been done under different uncertain environments like, fuzzy, intuiitonistic fuzzy, complex fuzzy, complex neutrosophic, etc. Besides, there are lot of scopes to work on soft set theory which have been summarized as follows:

1. In Chapters 2, 4, 5, 6, 7 and 8, we have proposed different types of decision-making approaches through soft set theory under different uncertain environments including, fuzzy, intuitionsitic fuzzy, linguistic, complex fuzzy, complex neutrosophic, etc. So, as a further research, one can develop these approaches to other uncertain fields like, vague soft set theory, rough soft set theory, hesitant fuzzy soft set theory, etc.

2. In Chapter 3, we have developed the idea of fuzzy soft cyclic group. As a further research, one can study the other algebraic structures like, ring theory, filed, etc. on fuzzy soft group.

3. Complex fuzzy soft set and complex neutrosophic soft set are two newly proposed generalizations of soft set theory. But, in literature, few works have existed on these topics. So, one can do further research in algebra, decision-making, game theory, etc. in the parlance of these two newly proposed soft sets.