

Chapter 9

Conclusion and scope for future work

9.1 Conclusion

In this study, DIFSAs and DIF-ideals in BCK/BCI -algebras have been proposed as the generalization of algebras and ideals in BCK/BCI -algebras in the environment of IFS.

The findings reveal that an IFS becomes a DIFSA/DIF-ideal in BCK/BCI -algebra iff this IFS is an IFSA/IF-ideal. The relations between DIF-ideals and UC of level and LC of level of a set in BCK/BCI -algebra have also been explored.

We have introduced DIFH-ideals in BCK/BCI -algebras. Also we have extended the notion of DP of IFSs to the notion of the generalised DP of two DIFH-ideals in two BCK/BCI -algebras U and V . For any numbers of BCK -algebra, same can be made more widespread. It has been shown that if M and N are two DIF H-ideal in U and V then the DP of M and N is also DIF H-ideal in $U \times V$. But the converse of this may not be true. It also be observed that if $M \times N$ is a DIF H-ideal of $U \times V$, then at least one of M and N is a DIF H-ideal of $U \times V$. It is obtained that the DP of two IFSs appears as DIF H-ideals and DIFSA iff for any $s_1, s_2 \in [0, 1]$, UC of level s_1 and LC of level s_2 are H-ideals or SAs in BCK/BCI -algebra $U \times V$.

In BCI -algebras we have defined DIF SI-ideals and investigated its properties. DIFP-ideals of BCI -algebras are also instigated. It is shown that any DIFP-ideal is always a DIF SI-ideal. We have shown by means of examples that a DIF SI-ideal

may not always be DIFP-ideal. Moreover, some other properties about DIF SI-ideal and DIFP-ideals of *BCI*-algebras are given. This particular approach can further be reached out and applied to other fuzzy algebraic systems like rings, semirings (hemirings), groups, semigroups, lattices, Lie algebras and *BCI*-algebras.

We have formed DIF Hyp-filters in Hyp *BE*-algebras and have given the characterizations of DIF Hyp-filters in Hyp *BE*-algebras by applying some important conditions on IFSs in Hyp *BE*-filters. Besides the authors also give characterizations of DIF hyp-filters in commutative Hyp *BE*-algebras. At the same time we deal with the notion of DIFI Hyp-filters in Hyp *BE*-algebras. We show that every DIFI Hyp-filters in Row-Hyp *BE*-algebras are DIF hyp-filters in Hyp *BE*-algebras and also give the condition such that a DIF Hyp-filters in Hyp *BE*-algebras to be a DIFI Hyp-filters in Hyp *BE*-algebras. Thus it extends the IF results to hyperstructures.

The notion of DIF translation of DIF SI-ideal as a generalisation of a DIF SI-ideal of *BCI*-algebra have been studied. Relationship between DIF translation of DIF SI-ideals and DIFSAs are given. Conditions for a DIF translation of a DIF SI-ideals of a *BCI*-algebras to be a DIF translation of DIF-ideals are provided. Further DIF extension, DIF multiplication and DIF magnified translation of DIFSA and DIF SI-ideals in *BCI*-algebras have been established. Some interesting relations among them are verified. Also we showed that the DIF magnified translation of a DIFS is a DIF SI-ideal extension of DIF multiplication of that DIFS and at the same time it also be verified that the DIF translation of an IFS is a DIF SI-ideal extension of DIF multiplication of that IFS. If we put $\beta = 1$ in DIF magnified translation then it reduces to DIF translation.

Finally, the study also contains the application of the concept of IVFS to DIVFSAs, DIVF-ideals in *BCK*-algebras and *BF*-algebras. We have introduced fuzzy translation, fuzzy multiplication of a DIVFSAs, DIVF-ideals in a *BCK*-algebra and have discussed the product of DIVF-ideals in *BCK* algebras and in *BF*-algebras.

9.2 Applications

Algebraic structures are found to have a vast and engrossing applications in several mathematical disciplines like information sciences, computer science, coding theory, physics, control engineering, topological spaces, etc. that are enough to supply simple

motivation among the research workers to re-establish multiple notions of modern algebra in amplified structure of fuzzy atmosphere.

In this digitised era information processing has a wide application whether it is the cutting of a tree to predict its falling position to the text book printing from a digital system. Classical logic is generally applied in information processing that deals with certain cases. It is obvious that non-classical logic is more powerful than the classical logic having its unique capacity to handle information with multiple facets of uncertainty. So, non-classical logic appears as an useful and powerful tool in computer science to handle with uncertain information.

Algebraic hyperstructures, one of the latest and natural extension of algebraic structures. Composition of two elements in algebraic structure always produces an element but a set is generated due to composition of two elements in the framework of algebraic hyperstructure. This theoretical extension of algebraic structure having a wide application in several fields of study like hypergraph, median algebras, lattices, cryptography, binary operation, automata, relation algebras, combinatorics, codes, AI, finite geometry, computer science and probabilities. Its applications also extended to the topics like hypergroups, hyperrings, hyperfields, hypermatrices, ordered hyperstructure semihypergroups etc. that hints at its massive importance in modern mathematical sciences.

In terms of the above notion it is obvious and apprehensible that the research in this direction can be fruitful for further developments of fuzzy BCK/BCI -algebra, fuzzy Hyp BE -algebra and of other algebraic structures. This has a strong potential to motivate and inspire the upcoming scholars to go through various concepts and end results from the algebraic structures in the broader anatomy of FSs.

9.3 Future works

We would like to optimistically opines that the proposed definitions and outcomes of this study can further be extended to some other DIF-ideals such as a -ideals, PI-ideals, implicative ideals in various algebraic structures in similar fashion. The study will be helpful in creating a significant impact on the upcoming scholars making them interested in this field and allied fields to open up new horizons of knowledge. We refer to hint at the following interesting research topics, briefly and futuristically, which are

worth investigating as further studies, like -

- (1) DIF Hyp-filters in Hyp B -algebra;
- (2) DIF Hyp-filters in Hyp BG -algebra;
- (3) Relationship between IF Hyp-filters and IF Hyp-ideals.

As our upcoming study in fuzzy structures of algebra we will try to explore the following topics with renewed interest and motivation:

- (i) To find DIVF SI-ideals in MV -algebras.
- (ii) To find DIVFP-ideals in PS -algebras.
- (iii) To find DIVF a-ideals in BCI -algebras.
- (iv) To find the relationship between translations of DIVF-ideals, P-ideals, submultiplicative ideals, a-ideals in TM -algebras.
- (v) To find IF-translations of DIFH-ideals in BG -algebras.