CONTENTS

Title Page		i
Certificate of	f Approval	V
Certificate		vii
Acknowledg	ements	ix
Declaration		xi
Abstract		xiii
List of Abbro	eviations	XV
List of Symb	pols	xvii
Contents		xix
Chapter 1	Introduction	1
	1.1 Introduction	1
	1.2 Preliminaries	3
	1.2.1 Preliminary concepts of fuzzy set theory	3
	1.2.2 Fuzzy operators	5
	1.2.3 Concept of IFS	6
	1.3 Linguistic variable and fuzzy number	7
	1.4 Basic definition and notation of fuzzy numbers	8
	1.5 Fuzzy reasoning for decision modeling	11
	1.6 Fuzzy inference methodology	13
	1.6.1 Mamdani inference scheme	14
	1.6.2 Tsukamoto's inference scheme	15
	1.6.3 Takagi and Sugeno fuzzy reasoning scheme	16
	1.7 Motivation and objective of the work done	17
	1.7.1 An overview of GFNs: theory and applications	18
	1.7.2 MADM technique under fuzzy environment	20
	1.7.3 Theoretical developments and applications of IFSs	23
	1.7.4 MODM under fuzzy framework	25

1.8 Organization of the thesis28Chapter 2Arithmetic Operations on Generalized Fuzzy Numbers312.1 Introduction312.2 Notations and arithmetic operations in fuzzy environment322.2.1 The fuzzy arithmetic operations using function principle (Chen 1985)322.2.2 Example332.3 Operations on GFNs34	
Chapter 2Arithmetic Operations on Generalized Fuzzy Numbers312.1 Introduction312.2 Notations and arithmetic operations in fuzzy environment322.2.1 The fuzzy arithmetic operations using function principle (Chen 1985)322.2.2 Example332.3 Operations on GFNs34	
2.1 Introduction312.2 Notations and arithmetic operations in fuzzy environment322.2.1 The fuzzy arithmetic operations using function principle (Chen 1985)322.2.2 Example332.3 Operations on GFNs34	
2.2 Notations and arithmetic operations in fuzzy environment322.2.1 The fuzzy arithmetic operations using function principle (Chen 1985)322.2.2 Example332.3 Operations on GFNs34	
2.2.1 The fuzzy arithmetic operations using function principle (Chen 1985)322.2.2 Example332.3 Operations on GFNs34	
(Chen 1985) 32   2.2.2 Example 33   2.3 Operations on GFNs 34	
2.2.2 Example332.3 Operations on GFNs34	
2.3 Operations on GFNs 34	
2.3.1 Sum of two GFNs 35	
2.3.1.1 Particular case: for GTFNs38	
2.3.1.2 More on the example of section 2.2.240	
2.3.2 Subtraction of two GFNs41	
2.3.3 Product of two GFNs 41	
2.3.3.1 Particular case: for GTFNs42	
2.3.4 Cases in which $\tilde{A}_1$ or $\tilde{A}_2$ are negative 44	
2.3.5 Division of GFNs 45	
2.4 Numerical illustration 46	
2.5 Conclusion47	
Chapter 3 A New Approach to Fuzzy Distance Measure and Similarity Measure	
for Generalized Fuzzy Numbers 49	
3.1 Introduction 49	
3.2 Fuzzy distance measure for GFNs 50	
3.2.1 Existing fuzzy distance measure (Chakraborty and Chakraborty	
2006) 50	
3.2.2 Construction of the new fuzzy distance measure 51	
3.2.3 Example 52	

	3.2.4 Metric properties	53
	3.2.5 Notation of ambiguity of a fuzzy number	57
	3.3 Similarity measure between two GFNs	60
	3.3.1 A note on the similarity measures for fuzzy numbers	60
	3.3.2 Fuzzy similarity measure of GFNs	63
	3.3.3 Properties	64
	3.3.4 Comparison with the existing methods	64
	3.4 Conclusion	67
Chapter 4	Fuzzy Compromise Ratio Methodology for Multiple Attribute	
	Decision Making	69
	4.1 Introduction	69
	4.2 Fuzzy compromise ratio method: a single expert MADM scheme	70
	4.2.1 An MADM scheme	71
	4.3 Numerical illustration	76
	4.4 Conclusion	81
Chapter 5	Fuzzy Group Decision Making to Achieve Consensus with Due	02
	Consideration of Degrees of Confidence of Experts' Opinions	83
	5.1 Introduction	83
	5.2 Representation of the fuzzy MAGDM problem	84
	5.2.1 Fuzzy aggregation process	85
	5.2.1.1 An iterative process	90
	5.2.2 Approximate reasoning approach: ranking procedure	98
	5.3 Diagnostic laboratory selection problem	100
	5.4 Conclusion	107

Chapter 6	A New Similarity Measure of Intuitionistic Fuzzy Sets and Its		
	Application in Multiple Criteria Decision Making	109	
	6.1 Introduction	109	
	6.2 New approaches to measure the similarity between IFSs	110	
	6.2.1 Construction of the new similarity measure	111	
	6.2.2 Properties	112	
	6.2.3 Comparison with the existing methods	115	
	6.3 Method for estimating priority based weights of the alternatives	117	
	6.3.1 The concept of intuitionistic preference relation in decision		
	making	117	
	6.3.2 A method to estimate weights of alternatives	118	
	6.4 Numerical illustration	120	
	6.5 Conclusion	121	
Chapter 7	A Theoretical Development of Distance Measure for Intuitionistic		
	Fuzzy Numbers	123	
	7.1 Introduction	123	
	7.2 Basic notions	124	
	7.2.1 Intuitionistic fuzzy number (IFN)	124	
	7.2.2 Defuzzification of the TIFN	129	
	7.2.3 $\varepsilon$ - cut representation of IFN	129	
	7.3 Existing distance measures for IFNs (Grzegorzewski 2003)	130	
	7.4 New distance measure for IFNs	131	
	7.4.1 Construction of the distance measure for IFNs	131	
	7.4.2 Distance measure for TIFNs	133	
	7.4.3 Metric properties	135	
	7.5 Numerical illustration	136	
	7.6 Conclusion	138	

Chapter 8	Multi-objective Optimization under Fuzzy Rule Constraints	139
	8.1 Introduction	139
	8.2 Basic notions	140
	8.2.1 Membership functions for the linguistic values of decision	
	variables	140
	8.3 Multi-objective optimization under fuzzy if-then rules	142
	8.4 Numerical illustration	146
	8.5 Conclusion	151
Chapter 9	A Fuzzy Linear Regression Model Based on S-curve	153
		1.50
	9.1 Introduction	153
	9.2 Basic notations	154
	9.2.1 Logistic membership function	154
	9.3 Simple approaches to fuzzy linear regression	155
	9.5.1 Fuzzy linear regression model	155
	9.5.2 Methodology for estimation of regression coefficients based	156
	0.4 Numerical example	150
	9.5 Conclusion	163
	3.5 Conclusion	105
Chapter 10	Conclusions and Future Scope of Study	165
	10.1 General conclusions of the thesis	165
	10.2 Contributions of the thesis	166
	10.3 Future scope of Study	166
Bibliography	Bibliography	
Appendix A	Fuzzified Data of Different GWPs for APA and NPA	185
List of Publications		187