Contents

page

Abstract ix
Acknowledgements xi
Contents xv
List of Figures xvii
List of Tables xix
List of Symbols xxi
List of Abbreviations xxiii

1 Introduction and Review of Literature **1**
1.1 Introduction 1
1.2 Review of Literature 3
1.2.1 Some important reliability measures 3
1.2.2 Stochastic orders 8
1.2.3 Majorization orders 12
1.2.4 Stochastic ageings 14
1.2.5 Copula 15
1.2.6 Coherent system 16
1.2.7 Usual order statistics 19
1.2.8 Sequential order statistics 20
1.2.9 Random weighted r-out-of-n system 22
1.2.10 Redundant component 23
1.2.11 Reliability importance measure 23
1.2.12 System signature 25
1.2.13 Some useful definitions 26
1.3 A Brief Discussion on the Main Results of the Thesis 26

2 Ordering and Ageing Properties of Systems **31**
2.1 Introduction 31

2.2 Main Results . . . 33
2.2.1 Stochastic comparisons of two systems . . . 33
2.2.2 Preservation of ageing classes under the formation of a system . . . 47
2.3 Examples . . . 52

3 Ordering and Ageing Properties of DSOS 59
3.1 Introduction . . . 59
3.2 Model Description and Useful Lemmas . . . 61
3.3 Main Results . . . 66
3.3.1 Stochastic comparisons of DSOS in one-sample scenario . . . 66
3.3.2 Stochastic comparisons of DSOS in two-sample scenario . . . 86
3.3.3 Ageing properties of DSOS . . . 92
3.4 Examples . . . 103

4 Orderings of Ordered Random Vectors 109
4.1 Introduction . . . 109
4.2 Ordered Random Vectors . . . 111
4.3 DSOS Model with Identical Components . . . 118
4.3.1 One-sample situation . . . 118
4.3.2 Two-sample situation . . . 125
4.4 DGOS Model with Identical Components . . . 127
4.4.1 One-sample situation . . . 127
4.4.2 Two-sample situation . . . 145
4.5 SOS Model with NDID Components . . . 148
4.5.1 One-sample situation . . . 148
4.5.2 Two-sample situation . . . 165

5 On Random Weighted Coherent Systems 169
5.1 Introduction . . . 169
5.2 A New Performance Measure . . . 171
5.3 System's Survivability Based on Survival Capacity . . . 172
5.3.1 Type-I survivablitity . . . 172
5.3.2 Type-II survivability . . . 184
5.3.3 Type-III survivability . . . 201

6 Reliability and Importance Measures 211
6.1 Introduction . . . 211
6.2 Model Description . . . 213

6.3 Random WCS with Type-I Survivability . . . 215
6.3.1 Reliability evaluation . . . 215
6.3.2 Birnbaum reliability importance measures . . . 219
6.4 Random WCS with Type-II Survivability . . . 223
6.4.1 Reliability evaluation . . . 224
6.4.2 Birnbaum reliability importance measures . . . 227
6.5 Random WCS with Type-III Survivability . . . 230
6.5.1 Reliability evaluation . . . 230
6.5.2 Birnbaum reliability importance measures . . . 233
6.5.3 A new structure-based weighted importance measure . . . 237
6.6 Simulated Data Analysis . . . 241

7 Conclusions and Future Work **245**
7.1 Concluding Remarks . . . 245
7.2 Future Work . . . 247
List of Publications from the Thesis . . . 249
Bibliography . . . 251