# Table of contents

Chapter 1 Introduction ......................................................... 1-23
  1.1 Interconnection Networks (Ins) ........................................ 2
      1.1.1 Design Dimensions of Interconnection Networks ............... 4
      1.1.2 Classification of Multistage Interconnection Networks .......... 12
      1.1.3 Performance Parameters ........................................ 15
  1.2 Need of the study ....................................................... 18
  1.3 Objectives of the study ................................................ 19
  1.4 Research Methodology .................................................. 19
  1.5 Scheme of the Study .................................................... 19
  1.6 Limitations of the study ............................................... 22
  1.7 Chapter Summary ........................................................ 22

Chapter 2 Review of Multistage Interconnection Networks .......... 24-50
  2.1 Introduction .............................................................. 24
  2.2 Construction and Performance of MINs .............................. 24
      2.2.1 Cube Interconnection Networks ................................ 24
      2.2.1.1 Extra Stage Cube (ESC) .................................... 27
      2.2.2 Shuffle Exchange Network ...................................... 27
      2.2.2.1 Shuffle Exchange Multistage Interconnection Network (SEN) ........................................... 27
      2.2.3 SEN with an Extra Stage (SEN+) ................................ 30
      2.2.4 Augmented Shuffle Exchange Network (ASEN-2) .............. 31
      2.2.5 Omega Network .................................................... 32
      2.2.6 Phi Network (PHN) ................................................ 33
      2.2.7 Double Tree (DOT) Network ..................................... 34
      2.2.8 Modified Double Tree Network (MDOT) ......................... 35
      2.2.9 Fault-tolerant Double Tree (FDOT) Network ................. 36
      2.2.10 Extra Group Networks ........................................... 37
      2.2.11 Augmented Baseline Network (ABN) ......................... 38
      2.2.12 Four-Tree Network (FT) ........................................ 39
      2.2.13 Quad Tree network (QT) ......................................... 40
      2.2.14 Zeta Network (ZTN) ............................................. 41
4.3.1.1 Permutation of ASEN-2 .............................................83
4.3.1.2 Permutation of IASEN .............................................83
4.3.2 Permutation Passibility in Presence of Faults .......................84
4.3.2.1 Permutation of ASEN-2 .............................................84
4.3.2.2 Permutation of IASEN .............................................85
4.4 Permutation Passibility Behavior of FT and IFTN .......................85
4.4.1 Permutation Passibility in Absence of Faults .......................85
4.3.1.1 Permutation of FT .................................................85
4.3.1.2 Permutation of IFTN .................................................86
4.4.2 Permutation Passibility in Presence of Faults .......................87
4.3.2.1 Permutation of FT .................................................87
4.3.2.2 Permutation of IFTN .................................................88
4.5 Permutation Passibility Behavior of ABN and IABN ....................88
4.5.1 Permutation Passibility in Absence of Faults .......................88
4.5.1.1 Permutation of ABN .................................................89
4.5.1.2 Permutation of IABN .................................................90
4.5.2 Permutation Passibility in Presence of Faults .......................91
4.5.2.1 Permutation of ABN .................................................91
4.5.2.2 Permutation of IABN .................................................92
4.6 Permutation Comparison of Proposed and Existing Networks ..........93
4.6.1 Permutation Comparison of ASEN-2 and IASEN ......................93
4.6.2 Permutation Comparison of FT and IFTN .............................95
4.6.3 Permutation Comparison of ABN and IABN ..........................97
4.7 Chapter Summary ..................................................................98
Chapter-5 Reliability Analysis .................................................100-116
5.1 Introduction .......................................................................100
5.2 Reliability Analysis Models ...............................................100
  5.2.1 Series Configuration Model .........................................100
  5.2.2 Parallel Configuration Model .......................................100
5.3 Assumptions .....................................................................101
5.4 Reliability Analysis of Existing MINs ....................................102
5.5 Reliability Analysis of Proposed MINs ..................................102
  5.5.1 Reliability Analysis of IASEN .......................................102

xiv
Annexure – C .................................................................C1-C16
Annexure – D .................................................................D1-D16