Contents

Preamble ix

Publications xv

1 Prologue 1
   1.1 Basic Definitions and Terminologies 1
   1.2 Theory of Neighborhood 9
   1.3 Theory of Coloring 13

2 Disjoint Neighborhood Sets in Graph 16
   2.1 Introduction 16
   2.2 Dual Neighborhood Number 18
   2.3 Open Problems 24

3 Bi-connected Neighborhood Number of a Graph 26
   3.1 Introduction 26
   3.2 Bi-connected Neighborhood Number 27
   3.3 Realizability 32

4 Generalized Perfect Neighborhood Number of a Graph 35
   4.1 Introduction 35
   4.2 Specific Families of Graphs 37
   4.3 Properties and Bounds 39

5 The Split and Nonsplit Nomatic Number of a Graph 42
   5.1 Introduction 42
   5.2 Split Nomatic Number 44
   5.3 Nonsplit Nomatic Number 46
6 The Vertex Cover Coloring Sets in Graph 53
  6.1 Introduction ........................................ 53
  6.2 Vertex Cover Chromatic Number ........................ 54
  6.3 Algorithmic Approach ................................ 63

7 The Dom - Chromatic Index of a Graph 65
  7.1 Introduction ........................................ 65
  7.2 Properties and Bounds ................................ 66
  7.3 Characterizations in Terms of Order .................. 71

8 On Vertex Chromatic Weighted Indices of a Graph 74
  8.1 Introduction ........................................ 74
  8.2 Vertex Chromatic Weighted Indices ..................... 75
  8.3 Chemical Trees ...................................... 81

9 Special Kinds of Colorable Complement Graph of a Graph 89
  9.1 Introduction ........................................ 89
  9.2 k - Colorable Complement .............................. 90
  9.3 k(i) - Colorable Complement ........................... 96

10 Neighborhood and Coloring Theory of Bio - Molecular Graph 101
  10.1 Introduction ........................................ 101
  10.2 The Matrix Method of Enumerating
        Graphs on a Lattice .................................. 104
  10.3 Illustrative Examples on 2D and 3D Structures ........ 106
    10.3.1 2D - LMR of 12 Residue Polymers ............... 106
    10.3.2 3D - LMR of 27 Residue Polymers ............... 111
  10.4 Neighborhood and Coloring Sets in Interaction Graphs .. 112

Glossary of Notations 115

Bibliography 120