

Contents

Abstract	v
Contents	x
1 Introduction	1
2 Preliminary concepts	7
2.1 Preliminary concepts of iterative methods	8
2.2 Preliminary concepts of dynamical analysis.	14
3 Multi-step iterative methods with derivatives to solve nonlinear equations	19
3.1 Introduction	20
3.2 Design of the family of iterative methods.	21
3.3 Convergence analysis.	26
3.4 Complex dynamics	29
3.5 Numerical Experiments	38
3.6 Conclusions	41

4	Derivative-free iterative methods for solving nonlinear equations	45
4.1	Introduction	46
4.2	Design of the family of methods and convergence analysis	47
4.3	Introducing memory	50
4.4	Dynamical analysis	60
4.5	Adding a new step to the family of iterative methods	70
4.6	Numerical experiments	84
4.7	Conclusions	89
5	Iterative methods to obtain solutions simultaneously	91
5.1	Introduction	92
5.2	Design and convergence analysis	93
5.3	Numerical experiments	97
5.4	Conclusions	102
6	Iterative methods for multiple roots	105
6.1	Introduction	106
6.2	Convergence analysis	107
6.3	Dynamical analysis	109
6.4	Convergence analysis of KMD	117
6.5	Solving multiple roots simultaneously	119
6.6	Numerical experiments	122
6.7	Conclusions	125
7	Family of iterative methods with Jacobian matrices for nonlinear systems	129
7.1	Introduction	130
7.2	Design of the parametric family	130
7.3	Convergence analysis	132
7.4	Dynamical analysis	134
7.5	Numerical experiments	143
7.6	Conclusions	147

8	Jacobian-free iterative methods	149
8.1	Introduction	150
8.2	Design of iterative scheme and convergence analysis	151
8.3	Numerical experiments	170
8.4	Conclusions	175
9	Iterative methods for simultaneous solutions of nonlinear systems	179
9.1	Introduction	180
9.2	Convergence analysis	184
9.3	Numerical experiments	187
9.4	Conclusions	189
10	Dynamical analysis of multidimensional iterative methods with memory	191
10.1	Introduction	192
10.2	Theoretical concepts	192
10.3	On the qualitative analysis of some vectorial iterative schemes with memory	196
10.3.1	Uncoupled Third Order System	196
10.3.2	Coupled Second-Order System	206
10.4	Conclusions	214
11	Conclusions and future work	217
11.1	Conclusions	217
11.2	Future work	219
A	Merits	221
A.1	Publications	221
A.2	Conferences	222
A.3	Others	223
A.3.1	Related to the area of Mathematics	223
A.3.2	Teaching merits	223
A.3.3	Contracts and grants	224
A.3.4	Research stay	224

A.3.5 Related to the area of languages.	224
Bibliography	226