

Contents

I	Background	1
1	Introduction	2
1.1	Introduction	2
1.2	Layout of the thesis	9
2	Preliminaries	11
2.1	Control Theory	11
2.2	Some Results from Analysis	20
II	Research Work	28
3	Controllability of Matrix Second Order Systems: A Trigonometric Matrix Approach	29
3.1	Introduction	30
3.2	Solution Using Cosine and Sine Matrices	33
3.3	Controllability: Linear System	34
3.4	Controllability: Nonlinear System	38
3.5	Computational Algorithm	42
3.6	Summary	47

4 Controllability of Matrix Second Order Systems: A General Operator Approach	48
4.1 Introduction	49
4.2 Controllability: Linear System	52
4.3 Controllability: Nonlinear System	54
4.4 Summary	57
5 Exact Controllability of Nonlinear Impulsive System	58
5.1 Introduction	59
5.2 Main Result	61
5.3 Summary	69
6 Controllability: By Spectral Method	70
6.1 Introduction	71
6.2 Controllability: Linear System	75
6.3 Characterization of controllability	78
6.4 Controllability: Nonlinear System	81
6.5 Computational Algorithm	84
6.6 Summary	88
7 Controllability of Urysohn Integral Inclusion of Volterra Type	89
7.1 Introduction	90
7.2 Controllability and Feed-Back Formulation	93
7.3 Solvability	94
7.4 The main Result	103
7.5 Summary	104

Summary	105
Appendix	109
Publications	125
Bibliography	126