

Contents

Preface	i
1 Introduction	1
1.1 \mathcal{H}_∞ -control	1
1.2 Unbounded inputs and outputs	9
1.3 Organization of the book	15
2 Pritchard-Salamon systems	17
2.1 Notation	17
2.2 Definitions	19
2.3 Frequency domain results	28
2.4 Perturbation results	31
2.5 Duality theory	37
2.6 Stability theory	48
2.7 Dynamic output-feedback	56
2.8 Riccati equations	69
3 Linear quadratic control and frequency domain inequalities	75
3.1 Introduction	75
3.2 Preliminary results	76
3.3 Problem formulation and main result	88
3.4 Proof of the main result	92
4 \mathcal{H}_∞-control with state-feedback	101
4.1 Problem formulation and main result	101
4.2 Proof of the state-feedback result	106
4.3 Relaxation of the a priori assumptions	124
4.3.1 Feedthrough from disturbance to output	124
4.3.2 How to ‘remove’ the regularity assumptions	128
5 \mathcal{H}_∞-control with measurement-feedback	130
5.1 Problem formulation and main result	131
5.2 Redheffer’s Lemma	139

5.3 Proof of the measurement-feedback result	144
5.4 Relaxation of the a priori assumptions	165
5.4.1 Including the feedthroughs	165
5.4.2 How to ‘remove’ the regularity assumptions	174
6 Examples and conclusions	177
6.1 Delay systems in state-space	177
6.1.1 Dynamic controllers for delay systems	180
6.1.2 A linear quadratic control problem	184
6.1.3 Duality	189
6.2 The mixed-sensitivity problem for delay systems	192
6.2.1 Introduction and statement of the problem	192
6.2.2 Main result	194
6.3 Conclusions and directions for future research	200
A Stability theory	205
A.1	205
A.2	206
B Differentiability and some convergence results	207
B.1	207
B.2	208
B.3	209
B.4	209
B.5	209
B.6	211
B.7	213
C The invariant zeros condition	214
C.1	214
D The relation between P, Q and \bar{P}	221
D.1	221
Bibliography	230
Index	239