## **Contents**

## Preface ix

2.0 Introduction 41

1	First	order differential equations 1	
	1.0	Introduction 1	
	1.1	Method of upper and lower solutions: Scalar case 1	
		(a) Initial value problems 1	
		(b) Terminal value problems 4	
		(c) Periodic boundary value problems 7	
	1.2	Monotone iterative technique: Scalar case 9	
		(a) Initial value problems 9	
		(b) Terminal value problems 13	
		(c) Periodic boundary value problems 16	
	1.3	Method of upper and lower solutions: Finite systems	19
	1.4	Monotone iterative technique: Finite systems 23	
		(a) Initial value problems 23	
		(b) Periodic boundary value problems 28	
	1.5	Applications to population models 31	
		(a) Competition 32	
		(b) Predator-prey 34	
	1.6	Monotone iterative technique for nonlinear equations	36
	1.7	Notes and comments 39	

2.1 Method of upper and lower solutions: Scalar case 41

(b) Periodic boundary value problems 472.2 Monotone iterative technique: Scalar case 53

(b) Periodic boundary value problems 56

(a) Boundary value problems

(a) Boundary value problems

3

5

2.3	Method of upper and lower solutions: Finite systems 58
2.4	Monotone iterative technique: Finite systems 65
2.5	Monotone method for transport problems 72
2.6	
2.7	
2.,	Trotes and comments
Ellic	otic differential equations 84
3.0	Introduction 84
3.1	Method of upper and lower solutions: Scalar case 84
3.2	
3.3	Monotone iterative technique: Scalar case 95
3.4	Method of upper and lower solutions: Finite systems 102
3.5	Monotone iterative technique: Finite systems 106
3.6	Applications to chemical reactions and population models 122
	(a) Belousov-Zhabotinskii reaction 122
	(b) Predator-prey system 126
3.7	Notes and comments 127
D	sholic differential equations 128
	Abolic differential equations 128 Introduction 128
4.0 4.1	
4.1	
4.2	Monotone iterative technique: Scalar case 144
4.4	Method of upper and lower solutions: Finite systems 153
4.5	
4.6	Applications to combustion problems and population models 175
	(a) Combustion theory 175
	(b) Population dynamics 181
4.7	Notes and comments 182
Нур	erbolic equations 183
5.0	
5.1	Method of upper and lower solutions 183
	(a) Initial value problems 183
	(b) Periodic boundary value problems 186
5.2	
	(a) Initial value problems 188
	(b) Periodic boundary value problems 190
5.3	Method of upper and lower solutions 194
5.4	Monotone iterative technique 199
	(a) Initial value problems 199
	(b) Periodic boundary value problems 203
5.5	Notes and comments 207

## Appendix 208

- A.1 First order equations 208
- A.2 Second order equations 210
- A.3 Elliptic equations 210
- A.4 Parabolic equations 216
- A.5 Hyperbolic equations 225

## References 226

Index 235