CONTENTS

PREFACE		ix
CHAPTER 1 FUNDAMENTALS OF STABILITY THEORY		
1.1	Introduction	1
1.2	Basics of Stability Behavior: The Spring-Bar System	3
1.3	Fundamentals of Post-Buckling Behavior	7
1.4	Snap-Through Buckling	18
1.5	Multi-Degree-of-Freedom Systems	20
1.6	Summary	23
Probl	ems	24
СНА	PTER 2 ELASTIC BUCKLING OF PLANAR COLUMNS	28
2.1	Introduction	28
2.2	Large-Deflection Solution of an Elastic Column	29
2.3	Differential Equation of Planar Flexure	32
2.4	The Basic Case: Pin-Ended Column	36
2.5	Five Fundamental Cases	39
2.6	The Effect of Imperfections	43
2.7	Stability of a Rigid Frame	52
2.8	End-Restrained Columns	55
2.9	Restrained Column Examples	62
2.10	Continuously Restrained Columns	74
2.11	Summary	80
Probl	Problems	
Appe	endix	85
СНА	PTER 3 INELASTIC COLUMN BUCKLING	87
3.1	Tangent and Reduced Modulus Concepts	87
3.2	Shanley's Contribution	93
3.3	Example Illustrating the Tangent Modulus and the Reduced	00
2.4	Modulus Concepts Publing Strangth of Stool Columns	98
3.4	Buckling Strength of Steel Columns	101
3.5	Illustration of the Effect of Residual Stresses on the Buckling Strength of Steel Columns	103

CONTENTS

3.6	Effect of Initial Out-of-Straightness and Load Eccentricity	108
3.7	Design Formulas For Metal Columns	123
3.8	Summary	130
Probl	ems	131
СНА	PTER 4 BEAM-COLUMNS	134
4.1	Introduction	134
4.2	General Discussion of the Behavior of Beam-Columns	135
4.3	Elastic In-Plane Behavior of Beam-Columns	138
4.4	Elastic Limit Interaction Relationships	147
4.5	Example Problems of Beam-Column Strength	149
4.6	Systematic Methods of Analysis: Flexibility Method	159
4.7	Systematic Methods of Analysis: The Stiffness Method	170
4.8	Inelastic Strength of Beam-Columns	186
4.9	Design of Beam-Columns	197
Probl	lems	199
СНА	PTER 5 FRAME STABILITY	203
5.1	Introduction	203
5.2	Two-Bay Frame Examples	206
5.3	Summary	230
5.4	Selected References on Frames with Partially Restrained Joints	231
Prob	lems	232
СНА	PTER 6 LATERAL-TORSIONAL BUCKLING	236
6.1	Introduction	236
6.2	Basic Case: Beams Subjected to Uniform Moment	237
6.3	The Effect of Boundary Conditions	246
6.4	The Effect of Loading Conditions	249
6.5	Lateral-Torsional Buckling of Singly-Symmetric Cross-Sections	259
6.6	Beam-Columns and Columns	270
6.7	Inelastic Lateral-Torsional Buckling	278
6.8	Summary	288
Prob	lems	289

CHA	PTER 7 BRACING	290
7.1	Introduction	290
7.2	Discrete Bracing	292
7.3	Relative Bracing	297
7.4	Lean-on Bracing	299
7.5	Effects of Imperfections	300
7.6	Column Bracing Provisions	302
7.7	Beam Bracing	306
7.8	AISC Design Provisions for Beam Bracing	308
7.9	Summary	314
Suggested Reading		315
Problems		315
CHA	PTER 8 SPECIFICATION-BASED APPLICATIONS OF STABILITY IN STEEL DESIGN	318
8.1	Introduction	318
8.2	Development of the Beam-Column Interaction Equations	319
8.3	Assessment of Column Strength	323
8.4	Assessment of Beam Strength	324
8.5	Specification-Based Approaches for Stability Assessment	330
8.6	Effective Length Factors, K-factors	344
8.7	Design Assessment by Two Approaches	354
8.8	Frame Design Requirements in Canada and Europe	359
8.9	Summary	361
Problems		361
REFERENCES		364
INDEX		369