

CONTENTS

	<i>page</i>
CHAPTER ONE	
Basic Principles	
1.1. Introduction	1
1.2. Basic Relationships	1
1.3. Virtual Work Principles	9
1.4. Minimum Energy Principles	13
1.5. The Rayleigh-Ritz Method	22
CHAPTER TWO	
Stiffness and Flexibility Methods	
2.1. Introduction	31
2.2. Stationary Total Potential Energy	31
2.3. Stationary Complementary Potential Energy	37
2.4. The Link Between Stiffness and Flexibility Methods	40
CHAPTER THREE	
Plane Stress – Plane Strain	
3.1. Introduction	43
3.2. Fundamental Relationships	43
3.3. The Finite Element Displacement Method	53
3.4. The Finite Element Force Method	82
3.5. Mixed Formulations	90
3.6. Axisymmetric Elements	93
CHAPTER FOUR	
Plate Bending	
4.1. Introduction	95
4.2. Plate Bending Theory	95
4.3. Finite Element Displacement Method	104
4.4. Finite Element Force Method	117

CHAPTER FIVE

Mixed Models for Plates

5.1. Reissner's Variational Principle	125
5.2. Some Comments on Integration of Discontinuous Functions ..	127
5.3. Discretized Variational Principle	131
5.4. Mixed Models	134
5.5. Hybrid Models	141
5.6. Comparison Studies	144

CHAPTER SIX

Shells

6.1. Introduction	153
6.2. Fundamental Relationships	154
6.3. Element Stiffness, Nodal Forces and Mass Matrices	159
6.4. Free Vibration Analysis	164
6.5. Arbitrary Excitation Analysis	168
6.6. Geometrically Non-Linear Analysis	172

CHAPTER SEVEN

Mixed Models for Shells

7.1. Introduction	181
7.2. Definition and Notation – Cartesian Formulation	182
7.3. Reissner's Principle	184
7.4. Model Based on Continuous Moment Field – Transverse Shear Deformation Included	187
7.5. Models Based on Negligible Transverse Shear Deformation ..	188
7.6. General Definitions of Element and System Matrices	189
7.7. Comparison Studies	197

CHAPTER EIGHT

Plasticity

8.1. Introduction	209
8.2. Plasticity Relations	210
8.3. Methods of Analysis	219
8.4. Combined Material and Geometric Non-Linearity	228
8.5. Application of the Methods	230
8.6. Concluding Remarks	253

CHAPTER NINE

Bound Methods in Limit Analysis

9.1. Introduction	259
9.2. Bound Methods	260
9.3. Plane Stress Problems	262
9.4. Plate Bending Problems	269
9.5. Results and Discussion	276
9.6. Conclusions	281

Isoparametric Elements

10.1. Introduction	..	..	..	..	..	..	..	..	..	283
10.2. Some Single Element Families	..	..	..	..	..	..	..	..	..	284
10.3. General Curvilinear Co-ordinates	..	..	..	..	..	..	..	..	..	287
10.4. Element Properties	..	..	..	..	..	..	..	..	..	292
10.5. Practical Applications	..	..	..	..	..	..	..	..	..	296
Appendix	..	..	..	..	..	..	..	..	..	299