
Table of Contents

PREFACE	v
LIST OF SYMBOLS	viii

PART ONE: GENERAL THEORY

Chapter 1: Stress and Strain

1.1 Stress, strain and strain rate tensors	1
1.2 Yield conditions	7
1.3 Problems	12

Chapter 2: Fundamental Concepts and Laws

2.1 Perfectly plastic solid	13
2.2 Power of dissipation	14
2.3 Geometrical representation	14
2.4 Fundamental assumptions on the power of dissipation	15
2.5 Illustrating examples	18
2.6 Problems	21

Chapter 3: Fundamental Theorems

3.1	Basic definitions and statements of theorems	24
3.2	Proofs of the theorems	25
3.3	Important remarks	29
3.4	Elastic-plastic and rigid-plastic bodies	31
3.5	Influence of changes of geometry	32
3.6	Solutions given by the deformation theory	36
3.7	Uniqueness	42
3.8	Appendix	42
3.9	Problems	46

Chapter 4: General Loading Case

4.1	Structures with nonnegligible dead load	48
4.2	Loading depending on several parameters	49
4.3	Shake-down analysis	49

Chapter 5: Generalized Variables

5.1	The concept of generalized variables	58
5.2	The general case – choice of the generalized variable	63
5.3	Eliminating the reactions	64
5.4	Obtaining yield conditions in generalized stresses	67
5.5	Simplified yield surfaces	95
5.6	Discontinuities	104
5.7	Appendix	107
5.8	Problems	108

PART TWO: APPLICATIONS TO PLATES, SHELLS, AND DISKS**Chapter 6: Metal Plates**

6.1	Introduction	111
6.2	Experimental information	113
6.3	Circular isotropic plates	123
6.4	Circular orthotropic plates	136
6.5	Isotropic rectangular plates	144
6.6	Review of other work	155
6.7	Deformations of metal plates	156
6.8	Minimum-weight design	169
6.9	Examples	196
6.10	Problems	197

Chapter 7: Reinforced Concrete Plates

7.1	Introduction	203
7.2	Yield condition and flow rule	207
7.3	Discussion of the yield condition	218
7.4	The kinematic method (Johansen's fracture line theory)	225
7.5	The static method	265
7.6	Minimum-weight of reinforcement	284
7.7	Influence of axial force	296
7.8	Influence of shear forces. Punching	308
7.9	Example of application	310
7.10	Problems	316

Chapter 8: Metal Shells

8.1	Introduction	325
8.2	Experiments on metal shells	326
8.3	Circular cylindrical shells axisymmetrically loaded	334
8.4	Rotationally symmetric shells	356
8.5	Torispherical and toriconical thin pressure vessel heads	364
8.6	Thin-wall beam with circular axis	375
8.7	Indications on other problems	388
8.8	Minimum-weight design	388
8.9	Examples of application	400
8.10	Problems	403

Chapter 9: Reinforced Concrete Shells

9.1	Introduction	407
9.2	Circular cylindrical tank under axisymmetric loading	410
9.3	Upper bound solutions	420

Chapter 10: Plane Stress and Plane Strain

10.1	Introduction	434
10.2	Plane stress: perforated disks	439
10.2	Notched bars in tension	456
10.4	Thin rotating disks	459
10.5	Other plane stress problems	469
10.6	Plane strain: thick tube	469

SUBJECT INDEX

476