# Contents

•

Introduction		XI
Chapter I.	Bounded Variation in Time	1
	By J. J. Moreau	
1.	Introduction	1
2.	Review of Contents	5
3.	One-sided Limits and Initial Conditions	8
4.	Functions of Locally Bounded Variation	10
5.	Monotone Change of Variable	14
6.	Differential Measures	16
7.	The Modulus Measure	21
8.	Subintervals	27
9.	Cumulative Distribution Functions	32
10.	Vector Measure Constructed Through a Bilinear Mapping	35
11.	Differential Measure of a Bilinear Expression	38
12.	Quadratic Forms, Chain Rule and Inequalities	43
13.	Densities and the Radon-Nikodym Property	49
14.	Derivative at a Point	54
15.	Isometric and Lipschitz Factorizations	58
16.	Conclusion	65
References .		71

Chapter II.	Hemivariational	<b>Inequalities and</b>	Their	Applications	75
-------------	-----------------	-------------------------	-------	--------------	----

#### By P. D. Panagiotopoulos

1.	Introduction	75
2.	Hemivariational Inequalities in the Theory of v. Kármán	
	Plates. Formulation of the Problems	77



3.	Coercive Hemivariational Inequalities in the Theory of	
	v. Kármán Plates	83
4.	Study of a Semicoercive Hemivariational Inequality	92
5.	Laminated Plates. The Delamination Effect and Related	
	Problems	98
6.	Study of a Variational-Hemivariational Inequality	103
7.	Subdifferential Material Laws and Nonmonotone Multi-	
	valued Boundary Conditions	116
8.	Study of the Resulting Variational-Hemivariational	
	Inequality	121
9.	Masonry Structures. Formulation and Study of the	
	Problem	126
10.	Additional Topics	134
References		140

Chapter III.	Optimal Design of a	Two-way Conductor		143
--------------	---------------------	-------------------	--	-----

# By G. Strang and R. Kohn

1.	Introduction	143
2.	The Design of a Conductor	144
3.	Strips of Strips	147
4.	The Variational Problem	149
5.	The Two-way Problem	151
Referenc	es	155

Chapter IV. Contact with Adhesio	n	157
----------------------------------	---	-----

### By M. Frémond

.

1.	Introduction	157
2.	Kinematic Variables	158
3.	Virtual Power of the Internal Forces	159
4.	Virtual Power of the External Forces	160
5.	The Principle of Virtual Power. Equations of Equilibrium	161
6.	Energy Balance	161
7.	The Second Principle of Thermodynamics	163
8.	Free Energy on the Small Deformation Assumption	165

•

9.	Properties of the Free Energy. Constitutive Laws	168
10.	Internal Dissipation. Constitutive Laws	170
11.	Isothermal Equilibrium of an Elastic Structure. Varia-	
	tional Formulation	178
12.	Classical Adherence Problems	180
References		185

Chapter V.	Yield Theory in Physics	187
	By M. Frémond	
1.	An Example in Mechanics	187
2.	An Example in Electricity	193
3.	An Example in Thermics	202
4.	Formulation of the Yield Design	209
5.	Equivalence of the Static and Kinematic Methods. Com-	
	parison of the Sets $K$ and $K_1$	213
6.	Yield Design and Unilateral Conditions	217
7.	Yield Design With a Nonlinear Equilibrium Mapping	228
8.	Concluding Remarks	239
References .		240

Chapter VI.	Quasi-static Evolution and Bifurcation Analysis in Standard Plasticity and Fracture	241
	By Q. S. Nguyen	
1.	Introduction and Mathematical Framework	241
2.	Discrete Variable: an Example in Fracture Mechanics	245
3.	Unidimensional Continuous Variable: an Example in	
	Elastoplasticity	251
4.	Three Dimensional Case of Elastoplasticity	259
5.	Conclusion	265
References .		266

Chapter VII.	On the Numerical Treatment of the Inclusion $O \in \partial f(x)$	267
	By J. J. Strodiot and V. H. Nguyen	
1.	Introduction	267
2.	The Bundle Method	269
3.	Convergence	280
4.	A Reduced Subgradient Algorithm	286
References		293
	· · · · ·	
		205

#### 

## By A. Visintin

1.	Introduction	295
2.	The Duhem-Madelung Model	297
3.	The Preisach Model	300
4.	Weak Formulation of Discontinuous Hysteresis Functions	303
5.	Study of Maxwell's Equations in a Ferromagnetic Body.	305
6.	A Biological Problem with Hysteresis	309
7.	Models of Plasticity	311
8.	A Microscopic Model of Ferromagnetism	316
9.	Surface Tension Effect in Phase Transitions	319
References .		323
Index		327