CONTENTS

	Preface	2	раде 111
EAPTER	Сомро	SITION AND RESOLUTION OF FORCE SYSTEMS	Ĩ
-	11	The Concept of a Force	2
	1.1	The Principle of Transmissibility	2
	13	Composition and Resolution of Forces	ט גי
	1.5	Composition of Non-Intersecting Forces	7
	15	The Definition of a Moment	6
	1.5	The Theorem of Moments	10
	1.0	Use of Vector Notation in Statics	15
	18	Rectangular Components of a Vector	15
8	19	The Scalar or Dot Product	16
	1 10	The Vector or Cross Product	18
	1 11	Infinitesimal Rotations Described by Vectors	19
	1 12	The Moment of a Force as a Vector Product	23
	1.13	The Properties of a Couple	24
	1.14	The Resolution of a Force into a Force and a	
		Couple	30
	1.15	The Resultant of a System of Forces	30
	1.16	Computation of Resultants	32
	1.17	The Free-Body Diagram	39
2	Тне Е	OUILIBRIUM OF FORCE SYSTEMS	52
	2.1	Equations of Equilibrium	52
	2.2	The Pin-Joint	61
	23	Two-Force and Three–Force Members	61
•	2.4	Constraint of a Rigid Body in Space	63
	25	Analytical Description of Constraint	64
	2.6	Degrees of Freedom	68
	2.7	Statically Indeterminate Systems	69

v

CHAPTER	2 K		PAGE	
3	Work	and Energy Methods	80	
	3.1	Work and Energy	81	
	3.2	The Method of Virtual Displacemerits	83	
	3.3	Virtual Displacements of Mechanical Systems	84	
	3.4	The Principle of Virtual Work	93	
	3.5	Stable, Unstable, and Neutral Equilibrium	96	
4	Cente	r of Gravity — Distributed Force Systems		
	— Flu	ID STATICS	106	
	4.1	Gravity Forces	106	
	4.2	The Center of Mass	108	
	4.3	Centroids of Areas, Lengths, and Volumes	109	
•	4.4	The Computation of Centroidal Distances		
	4.5	and Moments of Inertia of Areas	111	
	4.5	The Transfer Theorem for Moment of Inertia	112	
	4.6	The Polar Moment of Inertia of an Area	113	
	4.7	The Product of Inertia of an Area	120	
	4.8	I he Moment of Inertia of an Area about an Inclined Avis	122	
	10	Distributed Forces	127	
	4.5	Hydrostatic Pressure	131	
	4.10	Fluid Pressure Under Gravity	133	
	4 1 2	Hydrostatic Force on Plane Areas	134	
	4.13	Hydrostatic Force on a Curved Surface	136	
	4.10	Hydrostatic Force on a Submerged Volume	136	
	4.15	The Stability of Floating Bodies	138	
5	Frict	ION. THE APPLICATION OF STATICS		
· ·	то Ма	ACHINE DESIGN	146	
	5.1	Dry Friction	146	
	5.2	Pivot Friction	160	
	5.3	The Screw Thread	163	
	5.4	Brake-Band or Belt Friction	167	
	5.5	Rolling Friction	172	
	5.6	Thick-Film and Boundary Lubrication	177	
6	6 ELEMENTARY THEORY OF STATICALLY DETERMINA			
	STRUC	TURES	183	
	6.1	Rigid Planar Frameworks	183	

vie

CONTENT	C
CONTENT	э.

vii

CHAPTER			PAGE
	6.2	Plane Trusses	187
	6.3	The Method of Joints	187
	6.4	The Method of Sections	189
	6.5	Complex Trusses	190
	6.6	Graphic Statics	195
	6.7	The Graphical Solution for the Resultant of a Coplanar Force System	196
	6.8	Equilibrium Problems by Graphical Methods	199
	6.9	The Moment Diagram for Parallel Forces	202
	6.10	The Graphical Analysis of a Truss	205
	6.11	Beams and Beam Reaction Forces	207
	6.12	Shear Forces and Bending Moments in a Beam	208
	6.13	Differential Equations of Equilibrium of a Beam	213
	6.14	Computation of Bending Moments	216
	6.15	The Flexible Cable	221
	6.16	The Suspension Bridge	223
	6.17	The Transmission Line	226
7	INTROI STRUC	DUCTION TO STATICALLY INDETERMINATE	232
	71	Strass and Strain in Tansian and Compression	222
	7.1 7.2	Statically Indeterminate Problems in Tension	202
		and Compression	237
	7.3	Initial or Locked-In Stresses	244
	7.4	Thermal Stresses	245
Appendix I		BIBLIOGRAPHY	249
	11	I ABLES OF CENTROIDS, MOMENTS AND PRODUCTS OF INERTIA	250
Answe	Answers to Problems		263
Index			269