

CONTENTS.

CHAPTER I.

INTRODUCTION—FORCES ACTING AT A POINT.

	PAGE
Characteristics of a force	1
Newton's Laws of Motion	3
Transmissibility of force	3
Tension of a string	4
Smooth bodies	5
Resultant force	5
Parallelogram of forces	6
Resolution of a force	10
Triangle of forces	11
Lami's Theorem	13
Polygon of forces	14
Resultant of any number of forces acting at a point	15
Conditions of equilibrium for a particle	18
Friction	23
Particle on rough horizontal plane	25
" " inclined plane	27

CHAPTER II.

PARALLEL FORCES—MOMENTS—COUPLES.

Resultant of like and unlike parallel forces	32
Centre of parallel forces and centre of gravity	34
" gravity of a thin uniform rod	35
" " lamina in the shape of a parallelogram	36
" " " triangular lamina	37
Moment of a force	38
" " couple	41
Application of the principle of moments	43
Lever	44
The balance	48
The common steelyard	52
Theorems on couples	55
Couples in parallel planes	60

CHAPTER III.

COPLANAR FORCES.

	PAGE
Three force problems	64
Reduction of coplanar forces to a force or a couple	78
Conditions of equilibrium	78
" " of compound bodies	88
Further examples on coplanar forces	102
Reduction of coplanar forces to a force and a couple	113
Line of action of resultant	114
Conditions of equilibrium, other forms	115

CHAPTER IV.

GRAPHICAL CONSTRUCTIONS.

Force and funicular polygons	123
Bow's notation	126
Parallel forces	131
Loaded frameworks	134
Conditions for stiffening of a framework	147
Method of sections	149
External forces acting on ban of framework	152

CHAPTER V.

FRICTION.

Equilibrium of a single rigid body	157
Conditions for sliding or tilting	167
Equilibrium of jointed bodies	170
Further worked examples	174
Harder	179

CHAPTER VI.

WORK- MACHINES.

Work	194
Energy-Potential energy	195
Tension in an elastic string	196
Work done in stretching an elastic string	196
" " by a couple	197
Virtual work	199
Machines:--Velocity ratio--Efficiency	200
Systems of pulleys	202
Weston differential pulley	209
The wheel and axle	211
Overhauling	212
The screw	214
The differential screw	215

CHAPTER VII.

CENTRE OF GRAVITY.

	PAGE
Three rods forming a triangle	218
Tetrahedron	219
Pyramid and solid cone	220
Curved surface of a cone	220
Centre of gravity of a number of particles, general formulæ	221
" " " compound body or remainder	224
Quadrilateral lamina	236
Stability of equilibrium	240
Uniform circular arc	250
Sector of a circle	250
Segment of a circle	252
Solid hemisphere	253
Thin hollow hemisphere	254

CHAPTER VIII.

BENDING MOMENTS-SUSPENSION BRIDGES-CATENARY.

Bending moment and shearing force	261
Light beams loaded at intervals	263
Graphical construction for bending moment	269
Heavy beams and beams uniformly loaded	270
Particles suspended from a string	276
Suspension bridges	285
Catenary	288

CHAPTER IX.

VIRTUAL WORK-MISCELLANEOUS PROBLEMS.

Virtual work	296
Application of virtual work to stability of equilibrium	307
Miscellaneous problems	314

CHAPTER X.

FLUID PRESSURE-THRUST ON A PLANE SURFACE.

Fluid pressure	342
Pressure at a point, pressure intensity	342
" intensity at any point the same in all directions	343
Transmission of fluid pressure.. Pascal's Principle	344
Hydraulic press	344
Density and specific gravity	345
Pressure intensity in same horizontal plane	347
" " increases with depth	348
Atmospheric pressure	348
Free surface of liquid horizontal	349
Common surface of two liquids	350
Balancing columns of liquid	350
Whole thrust and resultant thrust	353
Resultant thrust on plane area	353

CHAPTER XI.

CENTRE OF PRESSURE.

	PAGE
Centre of pressure of rectangular lamina with one edge in surface	360
" " triangular lamina, vertex in surface	364
" " " " one side in surface	362
" " any plane area	363

CHAPTER XII.

THRUST ON ANY SURFACE.

Resultant vertical thrust on any surface	376
" horizontal thrust on any surface	378
" thrust on a closed surface	379
Archimedes' principle	380

CHAPTER XIII.

EQUILIBRIUM OF FLOATING BODIES.

Conditions of equilibrium of a body floating freely	386
Body immersed in two liquids	388
Hydrometers	402
Body held under heavier liquid by string	405
Floating body partly supported by a string	410
Weighing in air and water	414

CHAPTER XIV.

GASES.

Atmospheric pressure	414
Boyle's Law	415
Tension in walls of vessel containing gas	420
Decrease of atmospheric pressure with altitude	422