

CONTENTS

CONTENTS.....	3
PREFACE.....	6
INTRODUCTION.....	7
1 BASICS OF VECTOR ALGEBRA.....	9
1.1 Vector operations.....	11
1.1.1 Vector addition.....	11
1.1.2 Vector subtraction.....	12
1.1.3 Multiplication of vector by scalar.....	12
1.1.4 Scalar product.....	12
1.1.5 Vector product.....	13
1.1.6 Double vector product.....	14
1.1.7 Mixed product.....	15
1.2 Vector components in cartesian coordinate system.....	15
2 BASIC TERMS OF MECHANICS OF RIGID BODIES.....	20
2.1 Basic terms.....	20
2.1.1 Motion.....	20
2.1.2 Space.....	20
2.1.3 Mass point, body.....	21
2.1.4 Force.....	21
2.1.5 Time.....	24
2.2 Axioms and laws of statics.....	24
2.2.1 Newton laws.....	24
2.2.2 Two force system axiom.....	25
2.2.3 Axiom of identical effect.....	26
2.2.4 Axiom of vector summation.....	27
2.3 Force and their components in 3D space and in plane.....	28
2.3.1 Force components in 3D space.....	29
2.3.2 Force components in plane.....	29
2.4 Turning effect of force, force couple.....	30
2.4.1 Force moment with respect to point.....	31
2.4.1.1 Components of force moment.....	32
2.4.2 Moment of a force about an axis.....	33
2.4.2.1 Force momentswith respect to coordinate axes.....	34
2.4.3 Force couple.....	34
2.5 Degrees of freedom, constraints.....	35
2.5.1 Shape determinance.....	36
2.5.2 Statical determinancy.....	36
2.5.3 Degreees of freedom of free mass object.....	37
2.5.4 Typy of constraints.....	38

3	FORCE SYSTEMS	41
3.1	Central force system, mass point in plane and 3D space	41
3.1.1	Central force system in 3D space	42
3.1.2	Central plane force system	43
3.2	Line force system	46
3.3	General force systems, body in 3d space and plane	46
3.3.1	Replacement and equilibrium of general three-dimensional force system	46
3.3.2	Replacement and equilibrium of parallel force system in three-dimensional space	48
3.3.3	Replacement and equilibrium of general plane force system	49
3.3.4	Replacement and equilibrium of parallel force system in plane	52
3.4	Center of parallel force system, distributed load	53
3.4.1	Center of parallel force system	53
3.4.2	Distributed loads	55
4	PLANE TRUSSES	57
4.1	Static determinacy of plane trusses	59
4.2	Methods of static analysis of trusses	59
4.2.1	Method of joints	60
4.2.2	Method of sections (Ritter's section)	63
5	SYSTEMS OF MASS OBJECTS IN PLANE	66
5.1	Kinematic and static determinacy of a system of mass objects	67
5.2	Static solution of mass object systems	67
5.2.1	Analytical solution	69
6	GEOMETRY OF MASSES	72
6.1	Centroid	72
6.2	Moments of inertia	74
6.2.1	Moment of inertia of a mass point	74
6.2.2	Moment of inertia of a body	75
6.3	Moments of inertia of areas	76
6.3.1	Moments of inertia of an area	76
6.3.2	Moments of inertia on an area with respect to parallel axes	78
6.3.3	Section modulus in bending and torsion	79
7	PASSIVE RESISTANCE	81
7.1	Friction	81
7.2	Journal bearings, axle friction	85
7.2.1	Friction in radial journal bearing	86
7.2.2	Friction in axial journal bearing	87
7.2.2.1	New axial journal bearing	87

7.2.2.2	Axial journal bearing after run-in.....	88
7.3	Belt friction.....	89
7.4	Stiffness of ropes	91
7.5	Rolling resistance.....	92
	REFERENCES	97