

Table of Contents

Preface	v
Basic notation	xi
Introduction	1

Part I **Mathematical means** 11

Chapter I **The normal form of a Hamiltonian system** 13

1 The normal form of a linear system	14
2 Nonlinear normalization	25
3 Lowering the number of degrees of freedom	35
4 Periodic and conditionally-periodic solutions	40
5 Generalizations	44
6 Notes	48

Chapter II **Normalization of a Hamiltonian system near a cycle or a torus** 54

1 The normal form of a linear Hamiltonian system with periodic coefficients	54
2 The normal form in a neighbourhood of a periodic solution	62
3 The neighbourhood of an invariant torus	75
4 A system with two degrees of freedom	80
5 Notes	87

<i>Part II</i>	
Solutions of the limiting problem ($\mu = 0$)	93
 <i>Chapter III</i>	
Periodic solutions and arc solutions	95
1 Formulation of the restricted three-body problem	95
2 The two-body problem	97
3 The restricted three-body problem for $\mu = 0$	113
4 Notes	132
 <i>Chapter IV</i>	
Properties of arc solutions of the families S and T_N	133
1 Orbits of the families S	133
2 The structure of the set of characteristics of the families S and T_N	152
3 Values of the Jacobian constant	168
4 Notes	176
 <i>Chapter V</i>	
Extrema of the Hamiltonian function on families of arc solutions	178
1 The function G	178
2 Partial derivatives of the function G	182
3 Classification of the segments of the characteristics	186
4 Estimation of the number of intersections of a segment of a characteristic with a level line of the function G	187
5 The domain ρ_3	190
6 Conclusion	193
 <i>Chapter VI</i>	
Trajectories of collisions	194
1 The problem of two bodies P_1 and P_3	195
2 Trajectories of collision with P_2	206
3 Arc solutions with consecutive collisions	222
4 Isolation of critical solutions	228
5 Notes	230

Part III
Regular generating solutions 233

Chapter VII
Solutions of the second kind 235

1 Sets of periodic solutions	235
2 The restricted three-body problem	242
3 Averaging of the perturbing function	245
4 Computation of generating families	249
5 Concerning the programs	253
6 Other properties of the families E_N	254
7 Limits of generating families	255
8 Conditionally-periodic solutions of the second kind	262
9 Notes	263

Chapter VIII
Solutions of the first kind 266

1 Reduction to the normal form	266
2 Integration of the normal form for rational $\lambda = \tilde{p}/\tilde{q}$	275
3 Application to the restricted problem	283
4 Conclusion	288
5 The neighbourhood of stationary points	290
6 Notes	295

Chapter IX
Generating arc solutions from $\overline{\mathcal{C}_1\mathcal{C}_1}$ 298

1 Generating solutions of collisions with P_1	298
2 Computation of families of generating arc solutions	305
3 Asymptotics of families of generating arc solutions	310
4 Concerning periodic solutions with collisions	314
5 Notes	315

<i>Chapter X</i>	
Perturbations of hyperbolic orbits	317
1 The normal form	317
2 Application to the restricted problem	321
3 Notes	325
Appendix	
Tables of generating families and their perturbations	327
Bibliography	347
Author index	357
Subject index	359