

Contents

Introduction	ix
Chapter 1. General Results of the Theory of Hamiltonian Systems	1
1.1. Hamiltonian systems on a symplectic manifold	1
1.2. Poisson brackets and first integrals	3
1.3. Integrable systems and Poisson actions	6
1.4. A local structure of the orbit foliation of an action	8
1.5. Formulation of the classification problem for actions and IHVFs	14
Chapter 2. Linear Theory and Classification of Singular Orbits	17
2.1. Linear Poisson actions	17
2.2. Simple singular points of an action and IHVF (local theory)	26
2.3. One-dimensional orbits of the action	28
2.4. Singular trajectories of IHVF	39
Chapter 3. IHVF and Poisson Actions of Morse Type	43
3.1. Limit set of an orbit of the action	43
3.2. Class of Poisson actions and IHVFs of Morse type	45
3.3. General properties of PA of Morse type	46
Chapter 4. Center-Center Type Singular Points of PA and Elliptic Singular Points of IHVF	51
Chapter 5. Saddle-Center Type Singular Points	57
5.1. Extended neighborhood of a singular point, and its topology	57
5.2. Isoenergetic equivalence of IHVFs	63
Chapter 6. Saddle Type Singular Points	71
6.1. The degeneracy set	71
6.2. The types of loops and SPTs	73
6.3. Construction of the extended neighborhood	82
6.4. The invariant and formulation of the equivalence theorem	84
6.5. The structure of the auxiliary system and its invariant foliations	86
6.6. The topology of ∂V_ϵ	99
6.7. Proof of the equivalence theorems	107
6.8. The topology of the extended neighborhood V	119
Chapter 7. Saddle-Focus Type Singular Points	129
7.1. The structure of a garland and its separatrix set	129

7.2. The structure of the auxiliary gradient system	131
7.3. The construction of the conjugating homeomorphism in U	135
7.4. Proof of the isoenergetic equivalence theorem	137
7.5. The equivalence of actions	145
7.6. The topology of V	145
Chapter 8. Realization	149
8.1. Elliptic points	149
8.2. Singular point of the saddle-center type	149
8.3. Singular point of the saddle type	150
8.4. Singular point of the saddle-focus type	156
Appendix A. Normal Forms of Quadratic Hamilton Functions and Their Centralizers in $sp(4, \mathbb{R})$	163
Appendix B. The Gradient System on M Compatible with the Hamiltonian	167
Bibliography	175