

Contents

Preface	vii
Chapter 1. Introduction	1
§1.1. Notation	2
Chapter 2. Non-singularity and Resolution of Singularities	3
§2.1. Newton's method for determining the branches of a plane curve	3
§2.2. Smoothness and non-singularity	7
§2.3. Resolution of singularities	9
§2.4. Normalization	10
§2.5. Local uniformization and generalized resolution problems	11
Chapter 3. Curve Singularities	17
§3.1. Blowing up a point on \mathbb{A}^2	17
§3.2. Completion	22
§3.3. Blowing up a point on a non-singular surface	25
§3.4. Resolution of curves embedded in a non-singular surface I	26
§3.5. Resolution of curves embedded in a non-singular surface II	29
Chapter 4. Resolution Type Theorems	37
§4.1. Blow-ups of ideals	37
§4.2. Resolution type theorems and corollaries	40
Chapter 5. Surface Singularities	45
§5.1. Resolution of surface singularities	45

§5.2. Embedded resolution of singularities	56
Chapter 6. Resolution of Singularities in Characteristic Zero	61
§6.1. The operator Δ and other preliminaries	62
§6.2. Hypersurfaces of maximal contact and induction in resolution	66
§6.3. Pairs and basic objects	70
§6.4. Basic objects and hypersurfaces of maximal contact	75
§6.5. General basic objects	81
§6.6. Functions on a general basic object	83
§6.7. Resolution theorems for a general basic object	89
§6.8. Resolution of singularities in characteristic zero	99
Chapter 7. Resolution of Surfaces in Positive Characteristic	105
§7.1. Resolution and some invariants	105
§7.2. $\tau(q) = 2$	109
§7.3. $\tau(q) = 1$	113
§7.4. Remarks and further discussion	130
Chapter 8. Local Uniformization and Resolution of Surfaces	133
§8.1. Classification of valuations in function fields of dimension 2	133
§8.2. Local uniformization of algebraic function fields of surfaces	137
§8.3. Resolving systems and the Zariski-Riemann manifold	148
Chapter 9. Ramification of Valuations and Simultaneous Resolution	155
Appendix. Smoothness and Non-singularity II	163
§A.1. Proofs of the basic theorems	163
§A.2. Non-singularity and uniformizing parameters	169
§A.3. Higher derivations	171
§A.4. Upper semi-continuity of $\nu_q(\mathcal{I})$	174
Bibliography	179
Index	185