

CONTENTS

PREFACE	v
PART I. NON-DEGENERATE SMOOTH FUNCTIONS ON A MANIFOLD	
§1. Introduction	1
§2. Definitions and Lemmas.	4
§3. Homotopy Type in Terms of Critical Values	12
§4. Examples.	25
§5. The Morse Inequalities.	28
§6. Manifolds in Euclidean Space: The Existence of Non-degenerate Functions.	32
§7. The Lefschetz Theorem on Hyperplane Sections.	39
PART II. A RAPID COURSE IN RIEMANNIAN GEOMETRY	
§8. Covariant Differentiation	43
§9. The Curvature Tensor.	51
§10. Geodesics and Completeness.	55
PART III. THE CALCULUS OF VARIATIONS APPLIED TO GEODESICS	
§11. The Path Space of a Smooth Manifold	67
§12. The Energy of a Path.	70
§13. The Hessian of the Energy Function at a Critical Path .	74
§14. Jacobi Fields: The Null-space of E_{**}	77
§15. The Index Theorem	83
§16. A Finite Dimensional Approximation to Ω^C	88
§17. The Topology of the Full Path Space	93
§18. Existence of Non-conjugate Points	98
§19. Some Relations Between Topology and Curvature	100

CONTENTS

PART IV. APPLICATIONS TO LIE GROUPS AND SYMMETRIC SPACES

§20. Symmetric Spaces	109
§21. Lie Groups as Symmetric Spaces	112
§22. Whole Manifolds of Minimal Geodesics	118
§23. The Bott Periodicity Theorem for the Unitary Group	124
§24. The Periodicity Theorem for the Orthogonal Group	133
APPENDIX. THE HOMOTOPY TYPE OF A MONOTONE UNION	149