CONTENTS

Introduction xi
Chapter I Differentiable Manifolds 1
1. Differentiable manifolds 1
2. Vector fields 4
3. Differential forms 9
4. Tensor fields 12
5. Lie groups 14
6. Transformation groups 16
7. Principal fiber bundles 17
8. Reduction of structural groups 20
9. Associated fiber bundles 21
10. Examples 22
Chapter II Connections in Fiber Bundles 25
1. Connection in a principal fiber bundle 25
2. Parallelism 27
3. Holonomy groups 31
4. Curvature form and structure equation 34
5. Homomorphism of connections 35
6. Reduction theorem for connections 37
7. Holonomy theorem 39
8. Local flatness 41
9. Existence of connections 41
10. Connections in associated bundles 43
11. Examples 45
Notes for Chapter II 47
Chapter III Linear Connections 49
1. Linear connections 49
2. Torsion form and structure equations 51
3. Covariant differentiation 52
4. Γ_{ij}^{k} and equivalence of definitions 55
5. Torsion and curvature tensor fields 58

6. Bianchi's identity 61
7. Geodesics and completeness 63
8. Normal coordinates 64
9. Automorphisms and Killing vector fields 65
10. Linear connections with $\nabla T=0$, $\nabla R=0$ 69
11. Affine connections 73
Notes for Chapter III 76
Bibliography 78