

TABLE OF CONTENTS

| | Page |
|--|------|
| CHAPTER 1. INTRODUCTION TO CENTRE MANIFOLD THEORY . . . | 1 |
| 1.1. Introduction | 1 |
| 1.2. Motivation | 1 |
| 1.3. Centre Manifolds | 3 |
| 1.4. Examples | 5 |
| 1.5. Bifurcation Theory | 11 |
| 1.6. Comments on the Literature | 13 |
| CHAPTER 2. PROOFS OF THEOREMS | 14 |
| 2.1. Introduction | 14 |
| 2.2. A Simple Example | 14 |
| 2.3. Existence of Centre Manifolds. | 16 |
| 2.4. Reduction Principle. | 19 |
| 2.5. Approximation of the Centre Manifold | 25 |
| 2.6. Properties of Centre Manifolds | 28 |
| 2.7. Global Invariant Manifolds for Singular Perturbation Problems. | 30 |
| 2.8. Centre Manifold Theorems for Maps. | 33 |
| CHAPTER 3. EXAMPLES | 37 |
| 3.1. Rate of Decay Estimates in Critical Cases. | 37 |
| 3.2. Hopf Bifurcation | 39 |
| 3.3. Hopf Bifurcation in a Singular Perturbation Problem. | 44 |
| 3.4. Bifurcation of Maps. | 50 |
| CHAPTER 4. BIFURCATIONS WITH TWO PARAMETERS IN TWO SPACE DIMENSIONS | 54 |
| 4.1. Introduction | 54 |
| 4.2. Preliminaries. | 57 |
| 4.3. Scaling. | 64 |
| 4.4. The Case $\epsilon_1 > 0$ | 64 |
| 4.5. The Case $\epsilon_1 < 0$ | 77 |
| 4.6. More Scaling | 78 |
| 4.7. Completion of the Phase Portraits. | 80 |
| 4.8. Remarks and Exercises. | 81 |
| 4.9. Quadratic Nonlinearities | 83 |
| CHAPTER 5. APPLICATION TO A PANEL FLUTTER PROBLEM | 88 |
| 5.1. Introduction | 88 |
| 5.2. Reduction to a Second Order Equation | 89 |
| 5.3. Calculation of Linear Terms. | 93 |
| 5.4. Calculation of the Nonlinear Terms | 95 |

| | Page |
|---|------|
| CHAPTER 6. INFINITE DIMENSIONAL PROBLEMS. | 97 |
| 6.1. Introduction | 97 |
| 6.2. Semigroup Theory | 97 |
| 6.3. Centre Manifolds | 117 |
| 6.4. Examples | 120 |
| REFERENCES | 136 |
| INDEX. | 141 |