OSCILLATION THEORY FOR FUNCTIONAL DIFFERENTIAL EQUATIONS

L. H. Erbe
University of Alberta
Edmonton, Alberta, Canada

Qingkai Kong
Northeastern Illinois University
DeKalb, Illinois

B. G. Zhang
Ocean University of Qingdao
Qingdao, Shandong, People’s Republic of China

Marcel Dekker, Inc. New York • Basel • Hong Kong
Contents

Preface iii

Chapter 1. Preliminaries 1

1.0. Introduction 1
1.1. Initial Value Problems 2
1.2. Oscillation and Nonoscillation 4
1.3. Formulation of Boundary Value Problems for Functional Differential Equations 6
1.4 Fixed Point Theorems 8

Chapter 2. Oscillations of First Order Delay Differential Equations 14

2.0. Introduction 14
2.1. Stable Type Equations with a Single Delay 15
2.2. The Distribution of Zeros of Oscillatory Solutions 31
2.3. Unstable Type Equations 37
2.4. Equations with Oscillatory Coefficients 40
2.5. Equations with Positive and Negative Coefficients 45
2.6. Equations with Several Delays 50
2.7. Equations with Forced Terms 71
2.8. Single Population Models with Delays 76
2.9. Notes 93
Chapter 6. Oscillation of Systems of Neutral Differential Equations

6.0. Introduction and Preliminaries
6.1. Systems with Constant Matrix Coefficients
6.2. Systems with Variable Matrix Coefficients
6.3. Comparison with Scalar Equations
6.4. Existence of Nonoscillatory Solutions
6.5. Notes


7.0. Introduction
7.1. Lipschitz Type Conditions
7.2. Nagumo Type Condition
7.3. Leray-Schauder Alternative
7.4. Topological Transversality Method
7.5. Boundary Value Problems for Singular Equations
7.6. Notes

References

Index