University of Mosul

College of Computer Science and Mathematics

Department of Mathematics

Ph.D. Course in Computational Mathematics

Topics in Numerical Analysis

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Topics in Numerical Analysis مختارات في التحليل العددي

Chapter One:Numerical Analysis of Ordinary Differential Equation

1.1 Taylor-Series, Euler , Modified Euler and Runge Kutta Methods

1.2 Adams – Bash forth – Moulton Method

1.3 Milne-Simpson method and Hamming method

1.4 Finite – difference Method .

Chapter Two: Numerical Solution of Partial-Differential Equations and Elliptic equation

2.1 Difference Methods and Error Analysis .

Chapter Three: Parabolic Partial Differential Equations

3.1 The Explicit Method

3.2 Crank-Nicolson Method

3.3 Exponential FDM.

3.4 Local truncation error, Stability and Convergent of these Methods.

Chapter Four: Hyperbolic Partial Differential Equations of first order and second order

4.1 The Explicit Method .

4.2 Crank – Nicolson Method .

4.3 Local Truncation error and Stability of The Numerical Method.

Chapter Five: Numerical Analysis of Delay Differential Equations

5.1 Introduction to Delay Differential Equation .

5.2 Classification of DDEs.

5.3 A domain Decomposition Method.

5.4 Differential Transform Method .

Chapter Six: Finite Element Analysis of One-Dimensional Problems

6.1 Natural coordinates and isoparametric elements

6.2 Drive the shape function for the elements

6.3 Variational methods

References:

1- Shanthakumer , M. " Computer Based Numerical Analysis ",Khanna Publishers (1989)

2- Mathews J. H. " Numerical Methods Using Matlab " Printice-Hall, Inc.,(2004)

3- Yehuda Pinch over and Jacob Rubinstein " An Introduction to Partial Differential equations " Cambridge University Press (2005).

4- J.N. Reddy "An Introduction to The Finite Element Method"