

DEDICATION

To my family

my teachers and my friends

Acknowledgement

First of all I would like to thank Allah for blessing me and my family

Secondly I would like to extend thanks to my supervisor

Dr. Mohamed Hassan Mohamed Khabir who help me through this thesis

Aspecialthanks to Sudan University of Science and Technology, College of Science and all my friends

Abstract

The finite element method is a technique for systematically applying Galerkin's method to the approximate solution of boundary-value problems. In this thesis we construct a variational formulation of one-dimensional value problems, Galerkin approximation and we discuss modifications in these terms for different types of boundary conditions subsequently for one-dimensional problems. We generalized it to a two-dimensional problems. We show for the finite element interpolation how to partitioning the domain and how to construct and select shape functions to the approximate solution of boundary-value problem on triangle and rectangular elements. We discuss modifications in these terms for different types of boundary conditions subsequently for one-dimensional problem. Finally a linear interpolation by using shape functions and boundary conditions are constructed on triangular and rectangular elements.

Contents

Subject	Page
Dedication	I
Acknowledgement	II
Abstract	III
Contents	IV
Chapter 1 One- Dimensional Finite Approximation	1
1.1 Variational Formulation of Two –Point Boundary-Value Problems	1
1.2 Finite Element Approximation	۲۰
1.3 Boundary Conditions	۲۸
Chapter 2 Two-Dimensional Problems	۳۵
2.1 Introduction	۳۵
2.2 Two-Dimensional Boundary Value Problems	۳۶
2.3 Statement of the Boundary-Value Problem	۴۴
2.4 Variational Boundary-Value Problems	۴۶
Chapter 3 Finite Element Interpolation	۵۱
3.1 Discretization	۵۱
3.2 Piecewise-Linear Interpolation on Triangles	۵۴
3.3 Rectangular Elements	۵۸
3.4 Finite Element Approximations	۶۲
References	۷۷