ACKNOWLEDGEMENT

The guidance and support of many people have enlightened me in this tough period of life, especially the following personalities.

First and foremost I would like to express my profound gratitude to my research guide, Dr. P S Sreejith, Professor & Dean, Faculty of Engineering, Cochin University of Science and Technology, under whose patient supervision and guidance I have been able to complete my research. The unconditional support and sincere help from him has only caused this work real.

I wish to thank the Vice Chancellor and Registrar, CUSAT for the opportunity to complete the research work and submit the thesis. I also thank Dr. Radhakrishna Panicker, Principal, School of Engineering, Dr. Jayadas N H, Member, Doctoral Committee and Members of the Research Committee for guidance and help at various stages of the period of research. I wish to express gratitude to the office staff of various sections of CUSAT for their help and assistance. Thanks are also due to the Faculty, Division of Mechanical Engineering, School of Engineering, for all help and assistance provided in relation with the research work.

Sincere thanks are due to Dr. P. Suresh Kumar, Director, IHRD for the timely help and support.

I am indebted to my friends Dr Vinu Thomas, Mr. Johnson Philip, Mr Krishnadas G, Dr P V Shouri, Dr Ashok Kumar and Dr Priya for their constant encouragement and help throughout the research. I would like to thank my friends and colleagues at Model Engineering College, Thrikkakara and College of Engineering, Cherthala for the help and encouragement over the years of the research work.
I am deeply indebted for the consistent support given by my wife Dr Archana R without whom I would not have been able to complete the research. I have deep sense of gratitude to my daughter Aparna and son Chandrasekhar who had been understanding and patient for the whole period of my research. Thanks are also due to my friends, brothers, and in-laws for their sincere well wishes and prayers.

I am truly grateful for the blessings, of my parents N K Parameswaran Achari and late P P Saraswathy Ammal, which had guided me through the difficult path.

No work will become fruitful without the blessing of the Almighty - the creator, preserver and destroyer of the universe who himself is knowledge, power and truth. I submit my work on the lotus feet of the God.

Sreenivas. P