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Preface

This edited book, “**Lecture Notes in Electrical Engineering**”, is an outcome of the **International Conference on Applied Analysis, Computation and Mathematical Modelling in Engineering (AACMME-2021)**. The contents of this book are intended to present an overall idea about the recent advances in latest developments and researches in the field of Mathematical Science and its applications.

This book focuses on the comparative study of some wavelet based numerical methods to solve initial value problems. It also investigates the enhancement of natural convection heat transfer using hybrid nanofluids over a moving vehicle plate. This book addresses the provoked flow pattern due to an impulsive motion of porous wavy wall with no slip suction velocity under the influence of magnetic field.

In this book, a linear stability analysis is applied to study the onset of bio-convection in a suspension of negatively geotactic swimmers saturated with a non-Darcy porous fluid layer under the effect of high frequency and Small-amplitude vertical vibrations. This book also studies the impact of two temperatures on a generalized thermoelastic plate with thermal loading.

Baffle spacing has a decisive effect on heat transfer and pumping power. The development of baffle spacing significantly dominates the turbulence created inside the shell and tube heat exchanger and heat transfer. This book studies the impact of baffle spacing in both global and local thermohydraulic characteristics.

In this book, Kudryashov and modified Kudryashov techniques have been implemented to acquire new exact solutions of the time fractional (2+1)-dimensional CBS equation. This book also explores the impact of double dispersion effects on the nonlinear convective flow of power-law fluid along an inclined plate.

This book emphasizes the Soret and viscous dissipation effects on mixed convective flow of an incompressible micropolar fluid over a vertical frustum of a cone embedded in a non-Darcy porous medium subject to convective boundary condition. It proposes convergence and comparison theorems for three-step alternating iteration method for rectangular linear system. This book also studied thermal hydraulic performance of helical baffle shell and tube heat exchanger using RSM Method.

This book investigates a newly proposed dual-mode Kawahara equation. It finds out the soliton and periodic solutions of the Kawahara equation. In this book, the

Lie transformation method has been used to find out the group invariant solutions of (2+1)-dimensional modified Calogero-Bogoyavlenskii-Schiff (mCBS) equation.

This book addresses the estimation and classification of two logistic distributions with a common scale and different location parameters. Bayes estimates are computed using Metropolis-Hastings method using gamma and normal prior distributions. The Bayes estimates are compared with some of the existing estimates with respect to the bias and mean squared error. Utilizing these estimates some classification rules are proposed to classify a single observation into one of the two logistic populations under the same model.

The book considers the problem of testing of hypothesis for the quantile when independent random samples are drawn from two normal populations with a common mean and order restricted variances. Several test procedures are proposed and are evaluated through their sizes and powers using a simulation procedure.

In this book, various geometrical parameters of the planted roof are studied to optimize the dimensional parameters by means of independent and dependent variables using an exact mathematical model. Using experiment, the factors influencing the performance of the planted roof activity are identified to optimize the performance of the heat flow through planted roof.

This book deals with the modal analysis of a Jeffcott functionally graded (FG) rotor system, consisting of an FG shaft mounted on linear bearings at the ends. The material gradation is applied following the exponential gradation law, whereas the thermal gradients across the radius of the FG shaft are achieved through the exponential temperature distribution method 3D finite element modelling and the modal analysis of the FG rotor system are carried out using ANSYS software. The influence of the material gradation and temperature gradients on the rotor-bearing system's natural and whirl frequencies are studied.

This book presents five-point finite difference method to solve the two-dimensional Laplace and Poisson equations on regular and irregular regions. Dirichlet and Robin boundary conditions are considered for solving the system of equations in each iteration. The obtained numerical results are compared with analytical solutions.

This book also focuses on the selection of the best ultra-sound machine using ELECTRE method based on the user's criteria. This study considers six criteria to select best one from five alternatives.

This book examines the processes included for initiation along with expansion of a crack on the web of the rail weldment in order to anticipate the direction of fracture crack and secondary, the intervals of weld inspections. The finite element study for the expected cracking is performed to measure the brief history of stress intensity factors. Computational simulations and experimental findings made by RDSO on three-dimensional growth of fatigue crack are compared.

This book deals with a higher-order wave equation with delay term and variable exponents. Under suitable conditions, they prove the nonexistence of solutions in a finite time. There is no research related to higher-order wave equations with delay term and variable exponents.

In this book, the existence result of a solution to continuous nonlinear, initial value problem is studied. A special type of problem representing the time evolution of particle number density due to the coagulation, multi-fragmentation events among the particles present in a system has been considered. The proof of the main theorem is based on the contraction mapping principle. Initially the local existence of nonnegative solutions for these compactly supported kernels has been also proved in this book. The study is completed by examining the mass conservation law of the existing solution.

This book also introduces a new sequence of Szasz—Kantorovich type operators based on Boas - Buck type polynomials which include Brenke type polynomials, Sheffer polynomials and Appell polynomials. The error is estimated in the approximation by these operators in terms of the Lipschitz type maximal function, Peetre's K -functional and Ditzian–Totik modulus of smoothness. The order of convergence is also studied of these operators for unbounded functions by using the weighted modulus of continuity. This study also covers quantitative-Voronovskaya-type theorem and Gruss Voronovskaya-type theorem.

A study on the numerical modeling and simulation of heat distribution inside the skin tissue for cancer treatment with external exponential heating is also presented in this book. The two-dimensional Pennes bio-heat model for thermal therapy based on Fourier's law of heat conduction is considered in this study. The mathematical model's numerical solution is obtained using Crank Nicolson finite difference approximation and radial basis function approximation for time and space. The effects of thermophysical properties of the skin on the temperature profile in the tissue are also explained.

Overall, the chapters create new avenues and present intriguing information to comprehend the difficulties and provide answers for various challenges, which would assist readers grasp and implement for the new development and mathematically analyse physical problems.

The editors would like to express their appreciation to Springer, the Springer Editor, for publishing these chapters in "Lecture Notes in Electrical Engineering." We are also grateful to the anonymous reviewers who provided worthwhile review reports that resulted in significant modifications and enhancements to these chapters.

Rourkela, India
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