

1)

On non-commutative L_p spaces over a quasilocal Von Neumann algebra

by

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Abstract

This paper considers operators of the $\rho_{\wedge}^{\frac{1-p}{2}} \cdot \rho_{\wedge}^{\frac{1-p}{2}}$ in the context of non-commutative integration, and construct interpolating family of L_p spaces over a quasilocal von Neumann algebra generated by such operators. We defined a norm and showed that the norm satisfy the Holder's and Minkowski inequality.

Keywords: Quasilocal Von Neumann, non commutative L_p spaces, density matrix.

Page 1 – 6

2)

Combinatorial results for Subgroup of orientation preserving mappings

by

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Abstract

Let OPD_n be the subgroup of all orientation preserving bijective mappings of n -element set. It is shown that for n -odd there are n -even derangements, and for n -even there are $\frac{n}{2}$ even and $\frac{n}{2}$ odd derangements, respectively.

Keywords: Permutation, derangement, symmetries, full transformation, partial transformation, partial one-one transformation.

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3)

On an improved convergence rate estimate obtained by Liwei Liu

by

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Abstract

It is shown that any fixed point of a Lipschitzian strictly pseudo-contractive mapping T on a closed, convex subset K of a Banach space X may be norm approximated by an iterative procedure. Our argument improved the convergence rate estimate obtained by Liu [2, Theorem 2].

Keywords: Banach space, strictly pseudo-contractive mapping, Mann iterative process with errors.

AMS 2000 Mathematics Classification : Primary 147H17

Page 13 – 16

4)

On the existence of global optimization solution on abstract spaces

by

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Abstract

Herein is characterized the solution to global optimization problems using differential conditions and convexity assumptions. The uniqueness of the existence theorems of solution are proposed and proved. An application of the results obtained is shown to best approximation problem. The results here compliment similar results in our work in [15] where existence of solution to statistical estimation problems were established using classical projection theorem.

Keywords: Global Optimization, Differential Conditions, Convexity.

AMS Subject Classification (2000):49J52

Pages 17 – 22

5)

On the precise order of unit groups of Burnside rings of some finite Abelian groups

by

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Abstract

We determine the precise order of $B^*(G)$, for $G = \bigoplus_i G_i$, a bounded abelian 2-group, where G_i is a direct sum of r copies of a cyclic group of order 2^n . The cases $r = 1$ and $r = k$, for some natural number k , are respectively considered in this paper.

MSC: 05A10; 05A15; 15A03; 15A12; 19A49; 13D15; 20K01; 11N13.

Pages 23 – 28

6)
Iterative methods involving composed operators of the accretive type

by
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Abstract

In this paper, the equation

$$Lu = f,$$

where $L=A + B$, A a K -positive definite operator, B an L -positive definite operator, is solved in a Banach space. An iterative scheme which converges to the unique solution of this equations is also constructed. Finally, a composed equation involving other operators of the accretive type is also solved in a Banach space.

Keywords: K -positive definite, Iteration, weakly contractive, accretive.

Page 29 – 32

7)

Sylvester's series and Egyptian fractions

by
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Abstract

In number theory, Sylvester's sequence is a sequence of integers in which each member of the sequence is the product of the previous members, plus one. The first few terms of the sequence are 2, 3, 7, 43, 1807 ..., its values grow doubly exponentially, and the sum of its reciprocals (Sylvester's Series) forms a series of unit fractions that

converges to 1 i.e. $\frac{1}{2} + \frac{1}{3} + \frac{1}{7} + \frac{1}{43} + \frac{1}{1807} + \dots$ to 1. We examine the connection between Sylvester's Series and Egyptian fractions [1], as both of them can be used in number theory to represent any $x \in (0,1)$, in the form $x = \frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \dots$ where $a < b < c \dots$. Besides the difficulty in generating $a, b, c \dots$ using Sylvester's Series is overcome by developing Algorithms for Egyptian fractions [1].

Pages 33 – 36

8)

Ground state energy of the Hubbard Hamiltonian: Perturbative results.

by

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Abstract

The ground state energy of the single-band Hubbard model on the one dimensional lattice is computed using perturbation theory. It is shown that for two electrons the results obtained gets better as the positive on-site coulomb interaction (U) and the number of sites N are increased provided the ratio $\left(\frac{U}{N}\right)$ is made small. In other words, contrary to expectations, perturbation theory is applicable even if U is chosen to be large provided N is also chosen large enough so that the ratio $\frac{U}{N}$ is small.

Pages 37 – 40

9)

Variation of positron annihilation rates in metals

by

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Abstract

The local density approximation was used to calculate positron annihilation rates in several metals. The calculated positron annihilation rates in metals were compared with experimental values. Study of the calculated and experimental positron annihilation rates in metals down the groups and along the periods of the periodic table shows that

positron annihilation rates in metals decreases down the group for alkaline and earth-alkaline metals while it fluctuates down other groups. Along each period, positron annihilation rates in metals are least in alkaline metals. Positron annihilation rates in metals increases from the left of the period, and at about the centre of the period, it fluctuates and decreases towards the end of the period. The study also revealed that positron annihilation rates in metals are affected directly by the atomic concentration of the metals and is independent of atomic number. The variation of positron annihilation rates in metals with atomic numbers of the metals obtained in this work is in good agreement with experimental observation.

Keywords: Positrons, annihilation rates, metals and periodic table.

Pages 41 – 48

10)

Differences between general relativity and dynamical theory of gravitation in the resolution of radar sounding phenomenon to the order of C^{-5}

by

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Abstract

In a paper titled “Resolution of Radar Sounding Phenomena to the order of c^{-5} . According to General Theory of Relativity (GTR)” it was shown how the GTR resolved the radar sounding phenomena to the order of c^{-5} within the gravitational field established by the homogenous spherical massive sun. also in a paper titled “Resolution of Radar Sounding Phenomena to the order of c^{-5} according to Dynamical Theory of gravitation (DTR), it was shown how the DTG resolved the radar sounding phenomena to the order of c^{-5} within the gravitational field established by the homogeneous spherical massive sun. In this paper, the difference in the resolution of the radar sounding phenomena to the order of c^{-5} by the GTR and DTG shall be examined.

Pages 49 – 54

11)

Control of linear systems using pure time-delay

by

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Abstract

A synthetic technique is derived for control systems governed by linear differential-difference equations. It is shown that such a system is equivalent to an infinite-dimensional difference equation whose matrix elements can be readily calculated by recursive formulas. To accomplish this, we introduce sampling, and replace the differential-difference equation by an infinite-dimensional system of difference equation. The infinite-dimensional system corresponds exactly to the finite dimensional one. The computation of the necessary transition matrices is done by matrix iterations similar to those used to compute the transition matrices of ordinary linear systems. For results, two practical examples are illustrated. From this it takes but a slight extension of present day procedures to calculate a stable system.

Keywords: Linear differential difference equations, infinite-dimensional system, transition matrices and ordinary linear systems

Pages 55 – 62

12)

Relative controllability of nonlinear perturbed neutral systems with distributed and multiple delays in control

by

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Abstract

We establish a set of sufficient conditions for the relative controllability of nonlinear perturbed neutral systems with distributed and time varying multiple lumped delays in control. The results are established by using the Schauder fixed point theorem.

Keywords: Controllability, nonlinear perturbed neutral systems, distributed delays, multiple lumped delays, Schauder's fixed point theorem.

Pages 63 – 68

13)

Relative null controllability of nonlinear systems with multiple delays in state and control

by

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Abstract

Sufficient conditions for the relative null controllability of nonlinear systems with time varying multiple delays in the state and control are developed. Conditions are placed on the perturbation function which guarantee that if the linear control base system is proper and if the uncontrolled linear system is uniformly asymptotically stable, then the nonlinear delay system is relatively null controllable. As application, an example is given to illustrate the obtained results.

Keywords: Controllability, uniform asymptotic stability, nonlinear systems, multiple delays.

Pages 69 – 78

14)

Effect of the variation of hollow core diameter in rectangular plain concrete beams

by

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Abstract

The paper reports the investigation of the effect of varying the diameter of hollow core in Rectangular Hollow Concrete Beams (RHCC). It applied the moment of inertia theory in its investigation, combining a theoretical and practical approach. Timber was used to prepare the moulds to BS1881-109 specification. A standard mix ratio of 1:2:4:0.55 was used which concrete gave a compressive strength of 45kN/mm². The longitudinal holes were achieved by cutting holes of the various diameters in the end faces of the moulds, through which pipes of the corresponding diameter were passed and withdrawn after a 1 hour setting time. The dimensions of the beams were kept constant and the following hollow diameters were investigated; 0, 30, 50, 60, 75 and 105mm. The beams were subjected to flexural testing with the Universal Testing Machine (UTM) after curing for 28 days. Observation and recordings of deflections were carried out at 1kN intervals. At the ultimate loads, the beams failed by crack initiation at the bottom fibre which propagated to the top fibre. The investigation revealed that the ultimate failure loads of the beams increased up to an optimum 75mm diameter after which a considerable decrease in ultimate failure load was observed. The results show that hollow core enhances the flexural strength of rectangular concrete beams and by it, a saving of up to 19.64% by volume of concrete can be achieved. RHCC are usefully applied in voided slab decks in buildings, bridges and other structures.

Keywords: Hollowcore, Flexure, Moment of inertia, failure load and Economy.

Pages 79 – 86

15)

Dynamical analysis of a prestressed elastic beam with general boundary conditions under the action of uniform distributed masses.

by

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Abstract

The dynamic analysis of a uniform beam resting on an elastic foundation and subjected to uniformly distributed moving masses is investigated in this paper. The solution technique is based on generalized finite integral transforms, the use of the properties of the Heaviside function as the generalized derivative of the Dirac Delta function in the distributed sense and a modification of the asymptotic method of Struble. The analytical and numerical analysis show that increase in the axial force N and foundation stiffness K decrease the response amplitude of the uniform Bernoulli-Euler beams when under the actions of both moving distributed force or moving distributed mass. Also, for all illustrative examples, for the same natural frequency, the critical speed for the moving mass problem is smaller than that of the moving force problem. Hence, resonance is reached earlier in the former. Thus, it is tragic to rely on moving force solution as an approximation to the moving mass problem.

Keyword: Response of structures, Uniform beam, concentrated loads, distributed masses, moving masses, Boundary conditions, inertia effect.

Pages 87 – 102

16)

Perturbation technique on the dynamic stability of a lightly damped cylindrical shell axially stressed by an impulse

by

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Abstract

In this investigation, we examine the dynamic stability of a viscously damped finite imperfect circular cylindrical shell stressed by an axially impacted dynamic impulse. The formulation contains two small but mathematically independent parameters upon which asymptotic expansions are initiated using regular perturbation procedures. Simply-supported boundary conditions are assumed and the ensuing imperfection is taken strictly in the shape of the first term in the Fourier sine series expansion. The buckling modes, which are assumed strictly in the shape of imperfection, are obtained and the dynamic buckling impulse is evaluated nontrivially. It is observed that a viscously damped imperfect cylindrical shell buckles at a relatively higher dynamic impulse than an undamped one. Hence, damped cylindrical shells are dynamically more stable than

undamped ones in the sense that they can sustain higher dynamic pressures and become unstable only when the pressures are excessive.

Pages 103 – 120

17)

Initial post buckling of toroidal shell segments pressurized by external load

by

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Abstract

The static buckling pressure of imperfect toroidal shell segments under external load is here determined asymptotically by assuming that the stress-free imperfection can be represented as a two-term double Fourier series expansion. The buckling modes are taken strictly in the shape of the imperfection and simply-supported boundary conditions are assumed. Non-linear Karman-Donnell equations relevant to toroidal shell segments are used and the result clearly shows ,among other things , that the buckling load depends on all the Fourier coefficients that are admitted in the imperfection representation. The result is particularized to that of imperfect cylindrical shell segments. The load degradation is found to be of order two-thirds of the imperfection amplitude.

Pages 121 – 132

18)

Duffing oscillator as model for predicting earthquake occurrence I

by

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Abstract:

We consider the continental crust under damage. Using the observed results of microseism in many seismic stations we study a model – Duffing oscillator - which shows the same similarity with the time series of prevailing seismic waves that signals the occurrence of earthquakes in many earthquake prone areas of the world. In our study we use two models – the case where we include the effect of noise and the case where we consider the coda waves as the dominant force. We exhibit interesting results and their significance to earthquake prediction.

Keywords: microseism, damage mechanics, coda waves, Duffing oscillator, noise, resonance.

Classification: 74A60, 74J15, 74L05.

Pages 133 – 142

19)

On the wave equations of shallow water with rough bottom topography

by

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Abstract

We had earlier investigated the case of Shallow Water flow over a bottom with rough topography. However, in the solution and thus the graphs shown, we had only considered the real parts of the phase speed, C . In this present study, we included these neglected imaginary or complex parts as parts of the value of the phase speed so as to see its impact on the flow. With this therefore, we saw that the flow form in terms of the velocity and wave profile did not resemble at all. This therefore shows that the complex nature of the phase speed of the flow must be retained so as to get the true nature of the flow characteristics and pattern whenever any flow analysis has to be carried out about shallow water flow.

Pages 143 – 150

20)

Numerical methods for solving non-linear integral equations

by

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Abstract

This paper presents the numerical methods of Non-linear Integral Equations by Cubic Spline Collocation Tau Methods. Two Numerical collocation methods are applied to some nonlinear integral Equations after the non-linear Integral Equations have been linearized using Taylor's Series linearization scheme. Then the linearized Integral Equation is then evaluated for the purpose of comparison the computational cost, accuracy and the errors obtained for each method. The two numerical methods are Standard Cubic Spline Collocation Method (SCSCM) and Perturbed Cubic Spline Collocation Tau method (PCSCTM). These methods have been used by ref. [2] for solving singularly Perturbed second Order Differential Equations. Numerical examples

are given which show that the errors obtained by PCSCTM are smaller than that of SCSCM.

Pages 151 – 156

21)

Stability of critical points in a resistant medium under the influence of electric and magnetic fields

by

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Abstract

In this work, we consider the stability of critical points in a resistant medium for a set of coupled, autonomous, non linear system of differential equations under the influence of electric and magnetic fields. The results obtained from associated linear system and auxillary equations of the critical point show that the critical points are either stable or saddle (unstable) or unstable points depending on some conditions.

Keywords: Stability, critical points, resistant medium, electric and magnetic field.

Pages 157 – 160

22)

Electromagnetic fields and biotissue interactions

by

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Abstract

The interaction and effects of weak non-ionizing electromagnetic (EM) fields on biotissues have been considered. The application of linear response theory (LRT) shows that EM radiations may be absorbed at natural biotissue resonant frequencies. Although in-vitro studies have shown that physiological and chemical processes can be altered by the passage of EM fields, it has not been rigorously established that these effects are causative agents for cancer and gene mutation. The natural background thermal noise in biotissues is known to exceed the threshold for effects induced by weak external EM fields. Safe practice in the use of EM field generators, such as, cell phones, and the

installation of base stations are advocated as a means of mitigating against yet unknown possible long term effects in humans.

Pages 161 – 164

23)

Temperature field in a flow over a stretching sheet with internal heat generation and uniform heat flux

by

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Abstract

Mathematical formulations of the temperature distribution in the flow of a viscous incompressible fluid past a stretching sheet with internal heat generation and subsequent analytical solutions are the subject of this article. The velocity of the sheet is proportional to the distance from the slit and the sheet is subject to a uniform heat flux. A closed form solution of temperature is obtained in terms of incomplete Gamma function. During the course of discussion, the effects of Prandtl number and heat generation parameter on temperature field is extensively discussed. It is hoped that the solution reported herein will serve as a stimulus for experimental work and as a vehicle for understanding the problem of a polymer strip extruded continuously from a die, or a long thread travelling between a feed roll and a wind-up roll.

Keywords: heat generation, stretching sheet, uniform heat flux.

Pages 165 – 168

24)

Heat and mass transfer in the unsteady hydromagnetic free-convection flow in a rotating binary fluid II

by

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Abstract

The unsteady hydromagnetic free-convection flow near a moving infinite flat plate with heat and mass transfer is studied when chemical reaction is present. By adopting a further approximation on the steady temperature and concentration and in the absence of the soret term, the steady state equations are reduced to a set of coupled second

order linear differential equations and solved. This together with the transient solution show that in the presence of chemical reaction D_f and k_r does not affect the temperature while R decreases it. Also increase in D_f , R and k_r causes a depletion in concentration with the depletion in concentration due to R in a narrow region near the flat plate boundary.

Pages 169 – 178

25)

Radial flow of slightly compressible fluids: A finite element-finite difference approach

by

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Abstract

In this work, we develop a finite element-finite difference method to solve the differential equation governing the radial flow of slightly compressible fluids. The finite element method is used to carry out spatial approximations so as to study the variation of fluid properties at the various nodes to which effect we divided the entire radial domain of the fluid into a mesh of four radial 1-D quadratic elements which exposes nine nodes to intense study. Time approximation is done with the aid of the Crank-Nicolson finite difference scheme.

Keywords: Finite element method, Crank-Nicolson, Finite difference *scheme*, Time approximation, Radial 1-D quadratic element.

Pages 179 – 190

26)

Viscous dissipative heat effect on radiative magnetic flow of an electrolyte in a vertical channel

by

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Abstract

This paper presents the effect of radiation on the magnetohydrodynamics flow of an electrically conducting fluid inside an open-ended vertical channel, permeated by a uniform transverse magnetic field. Of particular interest is the investigation of the behavior of velocity, temperature, induced magnetic field, heat transfer across the walls and flow rate. The optically thick limit case is considered. The fluid is assumed incompressible and viscous, while the flow is steady. The viscous dissipation term is

therefore considered, in the “Governing equation”. The difference in temperature between the channel walls and that of the undistributed fluid is large enough for and is therefore physically important. The standard equations of continuity, momentum and energy and assumed and non-dimensionalised. The non-dimensional equations feature some non-dimensional parameters i.e. Grashof-number (Gr.), Birkman-number (Br.), Raynold-number (Rr.), Prandtl-number (Pm), Hartmann-number (M), etc. The resulting non-linear partial differential equations were solved analytically using successive approximation technique. It is found that increase in the magnetic field, the flow rate and velocity, but a decrease in the heat transfer at the walls and the temperature.

Pages 191 – 200

27)

A heat model for temperature distribution in a laptop computer

by

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Abstract

In this study, the heat diffusion equation that captures the maximum variation of temperature with time in an electronic note book (hp Compag nX6310 laptop computer) from its hot underside to its cool top is derived. Using appropriate boundary conditions (BCs) and transformations, the second order differential heat equation was solved and the solution which gives the temperature distribution of the system obtained. The model was tested with time ranging from 0.0s to 2100.0s at a prevailing room temperature of 28.0°C. The maximum temperature distribution within this time was 12.8°C at the bottom and 8.8°C at the top (keyboard) above the prevailing room temperature. These results were in excellent agreement with the measured (experimental) results when comparison was made between the two results.

Pages 201 – 206

28)

Application of finite element-eigenvalue method in the determination of transient temperature field in functionally graded materials

by

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Abstract

In this work, a finite element/eigen value method is formulated to solve the finite element models of time-dependent temperature field problems in non-homogenous materials such as functionally graded materials. The method formulates an eigen value problem from the original finite element model and proceeds to calculate the eigenvectors associated with the various eigen values from which the solution can be obtained thereby avoiding the use of time discretization that require lengthy calculations. The results obtained are exponential functions of time which when compared with the exact solution eventually tended to the steady state solution.

Keywords: Functionally Graded Materials, Finite Element Method, Transient Temperature Field,

Pages 207 – 224

29)

Pressure gradient and pressure derivative characteristics of a horizontal well subject to bottom water drive mechanism

By

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Abstract

Two kinds of dimensionless pressure derivatives, $\partial p_D / \partial t_D$ and $t_D \partial p_D / \partial t_D$, have been studied for a horizontal well in a bounded reservoir subject to bottom water drive mechanism. The influence of dimensionless well length and reservoir geometry was investigated. Possible flow periods for a given well completion were identified. Results show that dimensionless well length is a major determinant of the magnitude of both derivatives, especially at early flow times, and determines the number of flow periods obtainable. Well length modification can be used to produce the effects of a square reservoir with a rectangular reservoir and vice versa. Finally, large reservoirs are found to produce more clean oil than small reservoirs, given the same well completion and reservoir properties.

Pages 225 – 236

30)

Geophysical study of the aquifer characteristics and its environmental implications along River Ethiope, Delta State, Nigeria.

by
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Abstract

Geophysical survey was carried out in order to study aquifer characteristics (such as the depth, thickness and nature of soil materials above it) in the major communities along River Ethiope. Schlumberger vertical electrical sounding was conducted at Ugbomaya, Ajagolo, Ogegere, Abraka, Obiaruku and Ulogwe-Isumpe towns. The resistivity soundings were carried out with half current electrode spacing in the range 1-681m and six point per decade. The results were used to determine the depth, the percentage of clayey soil above the aquifer within the depth of investigation. The results showed a fresh water aquifer at depths, 20-55m, a subsurface with 100 percent of sandy soil in 64 percent of the locations investigated and 14-26 percent of clayey soil in 36 percent of the investigated locations.

Keywords: Vertical electrical sounding, Schlumberger configuration, aquifer characteristics, environmental implications, Ethiope River, Delta State.

Pages 237 – 244

31)

Geoelectrical study for ground water in waste dump sites: A case study of Warri and its environ, Delta State, Nigeria.

by

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Abstract

The existing waste dump sites in Delta State were investigated for ground water potential without soil disturbance by using the Schlumberger vertical electrical sounding (VES) with half current electrode spacing in the range 1-147m at six point per decade. The results revealed that the soil overlying the aquifer at Ovwian-Aladja dump site has resistivity values, 11.84-85.50 Ohm-m, thicknesses, 21.10-31.83m, at Warri it has resistivity values, 160-1074 Ohm-m, thicknesses, 1.53-7.87m. The results also revealed that the aquifer at Warri dump site has no sealing overburden while that at DSC waste site has a thick clay soil overlying it.

Keywords: Schlumberger Vertical Electrical Sounding - waste dump sites - thick clay- above quifer-contamination.

Pages 245 – 250

32)

Vertical electrical resistivity soundings to locate ground water resources in Sabongida-Ora: A feasibility study

by

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Abstract

Subsurface geo-electrical survey using the electrical resistivity (VES) method was carried out in Sabongida-ora, Owan West Local Government Area of Edo State in order to investigate the aquifer characteristics and ground water potential of the subsurface formations. Three vertical electrical soundings were carried out using the Schlumberger array configuration. The data was interpreted using the conventional curve matching and computer iteration method. The results reveal seven geoelectric layers. The true resistivity of the top soil varies from 29 to 61 Ω m while the thickness varies from 0.6 to 1.4m. The second layer has resistivity ranging from 14 to 109 Ω m and thickness ranging from 2 to 3m. This layer is the laterite zone. The third, fourth and the fifth geoelectric layers have resistivity ranging from 2 to 66 Ω m and thickness ranging from 5 to 17m. The resistivity is diagnostic of clay layer. These layers act as a confining layer to the aquifer. The sixth geoelectric layer has resistivity ranging from 6 to 48 Ω m and thickness varies from 15 to 33m this layer composes of fine to medium grain sand with little clay. This layer constitutes the first aquifer. The seventh geoelectric layer has a resistivity ranging from 24 to 177 Ω m the thickness of this layer is not defined since it is the last layer. This layer consists of medium to coarser grained sand which constitutes an aquifer of very good quality groundwater. The average depth of this aquifer is between 48 to 53m. The result was correlated with lithological logs from boreholes drilled in the study area and was found to be consistent.

Pages 251 – 260

33)

A geoelectrical investigation for ground water at Ivorri-Irri in Isoko South Local Government Area of Delta State

by

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Abstract

The preliminary basis of this investigation is to determine the aquifer layer in the area. The electrical resistivities layers were determined from the results of Schlumberger electrical sound at two VES (Vertical electrical sounding) stations in the study area. The interpretation of the resistivity sounding data indicates a depth of 124m for VES 1 and a

depth of 182m for VES 2 to the aquifer. The result of the resistivity survey shows that the aquifer is wet sands and generally indicates the thickness and kind of soil above the aquifer.

Keywords: Vertical Electrical Sounding, Schlumberger Configuration aquifer; Delta State.

Pages 261 – 266

34)

A geophysical study of structural foundations in Omolayo area, Ibadan, Nigeria

by

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²Geo-sore Consults, Akobo, Ibadan, Nigeria

Abstract

A surface geophysical method was used to study the various strata and depth of the layers in the strata of Omolayo area of Ibadan. Ten vertical electrical sounding (VES) data were acquired using the Wenner electrode configuration, which were subsequently processed and interpreted, based on the assessment of the iterative computer model, using a finite difference algorithm. Two geoelectric sections were generated along South-North and West-East, while their strike lengths were determined to be 80 m and 100 m respectively. These involve VES1, VES3 and VES8 along XX – XX' and VES2, VES3 and VES4 along YY – YY' sections. These sections reveal that the study area is underlain by three to four geoelectric units namely; clay/lateritic topsoil, weathered basement and fresh bedrock. Furthermore, geophysical contour maps equally revealed that the entire area is highly competent for super-structures or high-rise buildings, due to the high resistivity values obtained

Keywords: vertical electrical sounding, geoelectric, resistivity, Wenner- configuration, competence

pages 267 – 278

35)

Poisson impedance as an enhanced litho-fluid discriminator using crossplot analysis

by

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Abstract

The Poisson impedance as a tool for fluid and lithology discrimination in an oil-saturated sand reservoir was tested using seismic and well data set acquired from onshore Niger Delta. From the inversion results, AVO attributes such as the fluid factor and Poisson impedance were obtained. The result showed that Poisson impedance as a discriminatory tool between fluids and lithology have a higher amplitude resolution than the Fluid factor and the inverted acoustic impedance. These results agreed very well with the fluid and lithology discrimination using Poisson impedance and fluid factor attributes in an offshore Angola field and Gulf of Mexico

Pages 279 – 284

36)

On the control of pure inertia plant using a hybrid of sequential variation of extremals and invariant costate imbedding algorithms.

by

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Abstract

This paper presents the control of pure inertia plant using successive variation of extremals algorithm with invariant costate imbedding. Numerical experimentation is provided by the problem of sliding mass. The problem is solved by taking advantage of the Hamiltonian formalism via the construction of influence function matrices.

Keywords: Hamiltonian functional, necessary conditions for optimality, nonlinear systems, Pontryagin's maximum principle or Weierstrass conditions, state-costate variables, invariant imbedding.

Pages 285 – 296

37)

On optimal design of low-pass electronic filter using Chebyshev polynomial response

by

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Abstract

Application of optimization theory to engineering provides a design tool of quite extraordinary power: it offers the prospect of solutions to problems for which no normal design methods exist. In dealing essentially with circuit specification in frequency domain, the design problem includes deciding the size or order of filter required and computing optimum values for the components. In this presentation, Chebyshev response which is known to give fast cut-off frequency for a given template and involves no finite frequency transfer function is formulated to determine optimum components by applying a conjugate direction method proposed by the author in minimizing the objective function. This is a didactic presentation of what to do in the presence of this problem. No claim of originality in the theory of electronics and electrical engineering is made. Sensitivity analysis is undertaken.

Keywords: Template specification, Chebyshev response Conjugate direction quasi-Newton algorithm, Optimization, Computer-aided design, Design variables, Topology of the solution systems, Design objective function.

Pages 297 – 306

37)

Chebyshev definite analysis of velocity field computations for shape optimal design

by

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Abstract

A knowledge of the shape of optimizing process is significantly relevant in producing objects models especially when effort is being geared towards achieving special technological break through. This paper proposes a further analysis of previous work on the velocity field computations, as relates to producing shapes of optimal designs. With a case consideration, we establish results for handling the flow intensity of the process of varying the shape of a resource object. With presentation of some energy, we have obtained results for Lyquist stable designs.

Keywords: Dynamic shape changing process, assignment programming domain, flow frequency profile, zero – root control hypothesis.

38)

A class of stiffly stable hybrid second derivative continuous linear multistep methods for stiff IVPs in ODEs.

by

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Abstract

Hybrid methods incorporating one or more off-step points show promise of better stability characteristics and higher order than the conventional linear multistep methods (LMM). Infact, these type of methods provides a means of bypassing the Dahlquist order barrier for the conventional LMM. This paper is concerned with a class of stiffly stable hybrid second derivative continuous LMM with an off-step point. The methods are stiffly stable for step numbers $k \leq 8$ and of order $k + 3$. It is stiffly unstable when $k \geq 9$. The definition of stiff stability is found in Lambert [21], Enright [10] and Butcher [7]. The new methods are of comparable accuracy to that of Enright [10] and the state-of-the-art code, ODE15s in MATLAB.

Keywords: Continuous Linear Multi step Methods, off-step point, Hybrid method, Stability, Root-Locus.

Pages 313 – 336

39)

Strategies for deriving multi-derivative GMLM for the numerical solution of IVPs in ODEs

by

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Abstract

In the search for high accuracy, reliable and efficient numerical methods for initial value problems (IVPs) in ordinary differential equations (ODEs) the need arises to incorporate more analytic information of derivatives from the underlining ODEs into the design of a method. This presentation considers a strategy for deriving multi-derivative general multi-linear methods (GMLM) which is referred by Burrage and Butcher, the original inventors, as general linear methods (GLM), for the numerical solution of ordinary differential equations, see Hairer, Norsett and Wanner [31 pp385-401].The proposed

approach is to use continuous polynomial interpolation and collocation of the solution of the initial value problem. The purpose is to show that interpolation and collocation can be used as a veritable tool in the design of efficient, high order and highly stable GLM compared to the other means of Taylor series expansion, integration and differentiation, amongst other methods of deriving computational methods for IVPs in ODEs.

Pages 337 – 352

40)

General convergence analysis of a modified steepest descent method.

by

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Abstract

In this paper, we consider a modified steepest method and its convergence Analysis. The application of the eigen vectors and eigenvalues were properly used in the analysis. The more ill condition the matrix (i.e, the larger its condition number), the slower the convergence rate of the modified steepest descent method. In the same vein, the smaller the condition number K, the faster the convergence rate. Convergence of the modified steepest descent method is instantaneous if the eigenvalues are equal, are some of the results drawn from this work. However, it is concluded that if the condition number k is small convergence of the modified steepest descent method is quick irrespective of the starting point unlike the conventional method which is not amenable to such analysis.

Pages 353 – 358

41)

Convergence analysis of a modified conjugate gradient method

by

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Abstract

In this paper, the convergence analysis of the modified conjugate gradient method was thoroughly examined. The pick perfect polynomial and the energy norms were employed in the analysis. The convergence of the modified C G M after i iterations depends on how close a polynomial P_i of degree i can be to zero on each eigenvector given the constraint $P_i(0)=1$. The modified C G M algorithm finds the polynomial that minimizes the expression, but convergence is as good as the convergence of the least eigenvector. Also convergence of the algorithm is a function of the condition number. Again, this paper reinforces our understanding that the modified C G M yields the exact result after n -iterations, and further proves that the C G M algorithm is quicker if there are duplicated eigenvalues. Given infinite floating point precision, the number of iterations required to compute an exact solution is at most the number of distinct eigenvalues. Another important finding from this work is that the modified C G M algorithm converges more quickly when eigenvalues are clustered together than when there are irregularly distributed between a given interval. It is clear that the modified C G M converges greater than the modified steepest descent method (S D M) of our earlier work, as well as the conventional C G M, in many cases. Comparing S D M with the C G M algorithm, it was concluded that both algorithm have different time complexities for n - dimensional problems. It is obvious that these results are new and clear departure from the analysis of modified steepest descent method; since the modified CGM is an improvement on the earlier mentioned method.

Keywords: convergence, conjugate gradient, eigenvalue.

Pages 359 – 368

42)

A Chebyshev-collocation approach for a continuous formulation of hybrid methods for initial value problems in ordinary differential equations

by

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Abstract

In [3] - [5] we reported some classes of methods for the continuous solution of initial value problems in ordinary differential equations which was developed through multistep collocation and with Chebyshev basis functions. This paper extends the work to two classes of hybrid methods with equal success. Numerical evidences are provided in support of this work.

Keywords: Continuous, Scheme, Formulation, Approximant, Explicit, Implicit, Predictor, Corrector, Method, Hybrid.

Pages 369 -378

43)

Off-grid points exploitation in the development of more accurate collocation method for solving ODEs

by

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Abstract

In this paper, some directions to exploit grid/off-grid points for better and higher accuracy of one-step methods for solving Ordinary differential equations were suggested. Some methods were obtained from the continuous interpolation/collocation procedure. Numerical computations were done on some sample problems on a micro-computer and comparisons showed that the accuracy of the hybrid methods are better than some existing methods.

Pages 379 – 386

44)

On the Tau method for a Class of non-overdetermined second order differential equations

by

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Abstract

This paper is concerned with the tau methods for initial value problems in the class of non-overdetermined second order ordinary differential equations. Three variants namely the differential, the integrated and the recursive formulation are considered. The corresponding error estimates for the three variants are obtained and some selected examples are provided for illustration. The numerical evidences confirm the order of the tau approximants so obtained for all the cases.

Keywords: Tau method, differential, integrated, recursive, formulation, variant, canonical, polynomials, approximant, error, estimates.

45)

On the Tau method for certain over-determined first order differential equations

by

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Abstract

In Adeniyi et al. [7], we reported a generalization of the original formulation of the Tau method of Lanczos [14] with its associated error estimation. The generalized Tau method is not however, possible for all three variants of the method, namely the differential (or original), the integrated and the recursive formulation, due to the difficulty in constructing the so-called canonical polynomial which is the basis function required for the recursive form. Yet, it is worthwhile to compare the three variants, as much as feasible. Consequently, in this paper, we present the three variants together with their error estimates for a class of first order overdetermined ordinary differential equations with unit overdetermination. Numerical evidences are provided in support of the accuracy of our results.

Keywords: Tau method, variants, error, error estimate, recursive, differential, integrated, approximant, canonical polynomials, formulation.

Pages 399 – 408

46)

Asymptotic time complexity of an algorithm for generating the coefficients of the Chebyshev polynomials for the Tau numerical method

by

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Abstract

We describe the asymptotic behaviors of an algorithm for generating the coefficients of the Chebyshev polynomials for the Tau numerical method, due to the roles it plays in obtaining the approximate solutions of both ordinary and partial differential equations. This algorithm when well implemented will reduce the problem of over- determinate always encountered by Tau-method.

Keywords: Asymptotic behaviour, Tau-method, algorithm 1991 Mathematics subject

47)

Further implications of the quick evaluation of determinants

by

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Abstract

Ching-Tzong Su and Feng Cheng Chang introduced a method of evaluation of determinants by order reduction in their paper "Quick evaluation of determinants. Here we moved further to state that the determinant of any given matrix is equal to the determinant of the reduced matrix of order (2×2) . In addition we assert that the process leads to a huge saving in computing storage space as a matrix of order $(n \times n)$ ($n > 2$) is reduced to order (2×2) . This was demonstrated by examples.

Keyword: matrix, order and determinant.

(48)

Modelling the dynamics of tuberculosis in Nigeria

by

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Abstract

Mathematical models for the population dynamics of tuberculosis under the implementation of the direct observation therapy strategy (DOTS) in Nigeria are presented. The models establish conditions for the minimization and eradication of tuberculosis in Nigeria based on the fraction of infectious individuals treated under DOTS. The results from the models showed that there existed a stable disease free equilibrium provided the fraction of treated infectious individuals exceeded a critical value. The results showed that DOTS expansion in Nigeria must include a significant increase in the number of infectious individuals treated under DOTS else the effect in reducing the incidence of tuberculosis in Nigeria may not be achieved.

Keywords: Tuberculosis, DOTS, prevention and control, mathematical model.

Page 417 – 430

49)

Mathematical model of human genetics with overlapping generations.

by

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Abstract:

In this paper are present a mathematical model of human genetics with overlapping generations. The model which is a system of ordinary differential equations is analyzed using techniques from dynamical systems theory. It is shown that the system is always unstable. It is also shown that if $x(t)$, $y(t) = z(t)$ are the genotype frequencies, then $x(t)$, $y(t)$, and $z(t)$ respectively tend to constants as t increases.

Keywords: mathematical model, Human genetics, Overlapping generations, steady, state, dynamical system theory.

Pages 431 – 434

50)

Predator-prey mathematical model using Van Der Pol's equation

by

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Abstract

In this paper we present a predator-prey Mathematical Model using Van der Pol's equation. We consider a predator (A) and a prey (B) which interact in the following way: when B is large, A increases, eventually causing the collapse of B to a low level. At the low level, the prey increase in numbers and the predators decrease. The prey population eventually explodes to a high level, and the process repeats itself. In the absence of the predation, A the prey population has a stable low level, perhaps controlled by competition, a stable high level, and an unstable intermediate equilibrium. A model for this is derived by considering the deviation of prey and predators from the unstable equilibrium, say x for prey and y for predator. The model is converted to polar coordinates by introducing the new variables r and θ . The right-hand side of the equation is averaged for r and θ by integrating over θ from 0 to 2π while keeping r fixed. It was then

shown that the point $(x(t), y(t))$ approaches a periodic orbit that has amplitude 2 as t increases.

Keywords: Predator – Prey, Van der Pol's Equation, Periodic, Orbit, Amplitude Polar Coordinates.

Pages 435 – 438

51)

Mathematical modelling of mortality rate of broiler chickens

by

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Abstract

The poultry industry is one of the most successful agricultural ventures in a nation's economy. A good and stable economy allows for an improved animal husbandry which shall lead to better poultry production. Unfortunately this is not entirely so in the Nigerian experience. Our poultry industry still depends largely on governmental support for its sustenance. Mortality in broiler flocks represents lost income to growers. Though mortality is an everyday occurrence in broiler production, growers need to devise management programmes that will reduce its overall effect on flock performance. We formulate, by adopting some epidemic model approach, a mathematical model to help farmers initiate management programmes that will reduce the mortality rate and its overall effect on poultry production, and thus help the poultry business to be more successful.

Pages 439 – 442

52)

Choice of smoothing parameters in boosting kernel density estimates

by

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Abstract

This paper provides a scheme for choosing the smoothing parameter in boosting kernel density estimates. Several boosting algorithms are implemented using different choices of smoothing parameters and the "best" choice is found to be at order – four after considering different sets of data.

Keywords: Smoothing parameter, boosting, kernel density estimates, boosting algorithms, order-four.

Pages **443- 454**

53)

The Bayesian perspective of some sample survey design in survey non-response

by

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Abstract

In this work we outline the Bayesian approach to statistical inference for finite population survey. We argue that many standard design – based inferences can be derived from Bayesian perspectives using classical model with non informative prior distributions, thus the already existing methods do not need to be neglected. We show that the model for the selection mechanisms does not affect inferences about θ and $Q(y_u)$. The result of our finding however shows that Bayesian inferences under a carefully chosen model do enjoy good frequentist properties and a method derived under the design – based paradigm does not become any less robust under a Bayesian etiology.

Keywords: Baye's Theorem, Super Population Model, Ignorable Bayesian, Robustness Design Consistent.

Pages **455 – 460**

54)

Mark-resighting survey method for the estimation of population size in a closed animal population

by

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Abstract

The problem of estimating the population size of a closed population by method of mark –resighting sampling design was examined. We adopt the classical and Bayesian inference procedures related to the exact sampling distribution for our approximation. The maximum likelihood estimation (M.L.E) is derived for a case when N is large and it is observed that this estimator coincides with the M.L.E derived using the Binomial approximation.

Keywords: Binomial Approximation, Capture-recapture models, Mark-Resighting Survey
Maximum Likelihood Estimation.

Pages **461 – 466**

55)

Automated street lighting control

by

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Abstract

The control of street lights in some of the streets outside the campus and in university of Benin, Ugbowo Campus, Benin City, using Switching control circuit interfaced with a computer to enable effective control of the street light was investigated in this work.

The methodology adopted in this work includes:

- Designing and constructing a dc power supply unit which provides +12Volts and +5Volts to power the transistorized switching logic circuits and the Multiplexers respectively,
- Designing a suitable interface,
- Developing a control program written in visual Basic which is linked to the hardware with the help of the dynamic link library [DLL] program,
- Demonstrating the model work which had twelve 40 Watts connected in three circuits depicting the adjoining streets.

The sequence of address inputs and outputs functions are indicated and generated by the computer program. The switching time and delay time of ON/OFF of the circuits are dependent on weather and not time of the day. To have effective response signal of the weather we used photocells which drive the transistors into saturation and cut – off modes. The automated street lights control capable of handling up 167Amp. Current at 230Volts, and intended to eliminate human inadequancies, worked satisfactorily. The relevance of this scheme is its capability of saving electric energy consumption and reduction in man hour which translates to revenue saving. All these could results in new concept and development in our environment.

Nomenclature

DLL: Dynamic link library, IC: Integrated circuit, KBPs: Kilobytes per seconds

LPT: Link port terminal, PID: Proportional integral differential, TDM: Time division

Multiplexing, TTL: Transistor-transistor logic, VB: Visual basic

Pages **467 – 478**

56)

A constrained optimal stochastic production planning model

by

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Abstract

This paper considers the stochastic production planning problem with the constraint that the inventory level exceeds the demand over a planning period. Using the existence of a homogeneous Markov non-randomized optimal policy, the existence of a unique solution to the associated Hamilton-Jacobi-Bellman equation is established and the optimal policy is characterized. Also advocated is a stochastic iterative procedure for locating the optimal inventory level.

Keywords: Stochastic differential equation, Hamilton-Jacobi-Bellman equation, inventory level, production control and Markov policy.

Pages **479 – 484**

57)

Universal hash proof system and the subset membership problem

by

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Abstract

The notion of a universal hash proof system is hereby introduced. Essentially, this is a special kind of non-interactive zero-knowledge proof system for a language. We showed how to construct very efficient universal hash proof systems for a general class of group-theoretic language membership problems. We showed how to construct efficient universal hash proof systems for languages related to the Decision Composite Residuosity (DCR) and Quadratic Residuosity (QR) assumptions. From these one can get corresponding public-key encryption schemes that are secure under these assumptions.

Keywords: Cryptographic Hash Function Statistical Distance, Random Oracle, Projective Hash, Subset membership

Pages **485 – 494**

58)

Universal hash proof systems: A construction for a provably-secure public-key encryption scheme

by

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Abstract

this paper presents a new and fairly practical public-key encryption scheme proven secure against adaptive chosen ciphertext attack. The scheme is based on Decision Composite Residuosity (DCR) assumption. The analysis of the scheme is in the standard cryptographic model, and does not rely on the Random Oracle model. We show how to construct an efficient public-key encryption schemes secure against adaptive chosen ciphertext attack in the standard model. Our construction only uses the universal hash proof system as a primitive: no other primitives are required, although even more efficient encryption schemes can be obtained by using hash functions with appropriate collision-resistance properties.

Keywords: Public-key Encryption, Decision Composite Residuosity, Adaptive-chosen Attack, Universal Hash Proof, Random Oracle.

Pages 495 – 504

59)

Matrix and vector data structures-foundation for scientific computing in C++

by

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Abstract

Matrices and vectors have a wide range of applications in science and engineering, those applications require that vectors and matrices be defined and used in systems design. However the matrix and vector data structures and their operations are not generally defined in some modern programming languages such as C++. Every C++ programmer who wishes to use them must implement them from scratch using primitive data types, even though the task he wants to perform may not be the development of data structures per se; this is a difficult task even for experienced C++ programmers. This paper presents a set of reusable template C++ matrix and vector classes capable of the basic allowable operations on vectors and matrices; which can

be used by the C++ programmer who requires the task of defining and using vectors and matrices on the fly. They can therefore be used as a basis in scientific computing and computational linear algebra. They have been tested successfully on the Linux and Windows platforms.

Pages 505 – 516

60)

A comparative study of two different embedding functions

by

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Abstract

We examine the electron density obtained from two embedding functions, regarded as model I and model II, from the Separable Potential Method for six FCC metals; Ni, Cu, Pd, Pt, Au and Ag. The purpose is to investigate whether a unique electron density could be obtained from the two functions using Johnson's alloy model. Experimental dilute limit heats of solution of the binary alloys of these metals were used as input parameters. The embedding functions are essentially the same for the two models from $\rho = 0$ up to $\rho = 5\rho_e$ for Ni, Cu and Ag. The functions diverge from about $1.3\rho_e$ upwards for Pd and from about $1.8\rho_e$ upwards for Pt and Au. The equilibrium electron density, ρ_e , was taken as k/Ω , where k is an integer and Ω is the atomic volume. Two different electron densities were derived from each model for $k < 30$ but at higher values of k the two electron densities became identical. The lower electron density in each case was found to increase linearly with k . Though the two embedding functions were identical in some density regions, the observed differences between them may be the reason for non-uniqueness of the electron densities derived from them.

Keywords: Analytic Electron Density, Embedded Atom Method, Semi-Empirical Methods.

Pages 517 – 524

ABSTRACT VOL 13

1)

Quantum geometrodynamics

by

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Abstract

In this paper we construct the whole of physics on the basis of three geometrical principles, namely, invariance of dimensionality, Lorentz invariant operators, and parity transformation. We call this scheme quantum geometrodynamics. We extract from the scheme the Nature's Blue Print (that is the basic ingredients from which all the furniture of the Universe are built); ipso facto we have constructed the theory of everything.

Keywords: Manifold, geometry, state, dimensionality, 4-operators, Invariant operators, fermions, bosons, fermion-bosons Interaction.

2000 MSC: 81-XX, 81S10, 5IFxx, 51Nxx

Pages **1 – 8**

2)

Precision measurement of the electron/muon gyromagnetic factors

by

A. M. Awobode

Abstract

Clear, persuasive arguments are brought forward to motivate the need for highly precise measurements of the electron/ muon orbital g , i.e. g_L . First, we briefly review results obtained using an extended Dirac equation, which conclusively showed that, as a consequence of quantum relativistic correction arising from the time-dependence of the rest-energy, the electron gyromagnetic factors are corrected. It is next demonstrated, using the data of Kusch and Foley on the measurement of $(\delta_S - 2\delta_L)$ together with the modern precise measurements of the electron $\delta_S(\delta_S \equiv g_S - 2)$, that δ_L may be small (-0.6×10^{-4}), non-zero quantity, where we have assumed Russel-Saunders (LS) coupling and proposed, along with Kusch and Foley, that $g_S = 2 + \delta_S$ and $g_L = 1 + \delta_L$. Therefore, there is probable evidence from experimental data that g_L is not exactly equal to 1: the expectation that quantum effects will significantly modify the classical value of the orbital g is therefore reasonable. Finally, we show that if, as suggested by the results obtained

from the modified Dirac theory, δ_s and δ_L depend linearly on a dimensionless parameter Δ such that the gyromagnetic factors are considered corrected as follows; $g_s = 2(1 + \Delta)$ and $g_L = 1 - \Delta$, then the Kusch-Foley data implies that the correction $\Delta \approx 1.0 \times 10^{-3}$; it is noteworthy that Δ is of the same order of magnitude as the measured $(g_s - 2)/2$ which, to five places of decimal, is equal to 1.12×10^{-3} . Thus, available spectroscopic data indicate that g_s and g_L may both be significantly modified, such that g_s that is increased by 2Δ , while g_L is decreased by Δ , the quantity 2Δ being equal to the precisely measured $g_s - 2$. Modern, high precision measurements of the electron and muon orbital g_L are therefore required, in order to properly determine by experiments the true value of $g_s - 1$, perhaps to about one part in a trillion as was recently done for $g_s - 2$.

Pages 9 – 16

3)

On the coefficients of holomorphic functions and the identity $S_n - S_{n-1} = \binom{2n}{n}$

by

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Abstract

We give, in this note, a simple proof of the identity. $S_n - S_{n-1} = \binom{2n}{n}$, $n \geq 1$ where

$$S_n = \sum_{i+j+k=n} \binom{i+j}{i} \binom{j+k}{j} \binom{k+i}{k}$$

by relating it to the coefficients of the series expansion of a holomorphic function of several complex variables where the summation is taken over all non-negative integers i, j, k such that $i + j + k = n$.

Keywords: Holomorphic functions, series expansion of holomorphic functions, coefficients of series expansion, absolute terms of an identity.

2000 Mathematics Subject Classification: 05A19, 32A10, 32A05

Pages 17 – 20

4)

On Rouché's theorem as a criterion for irreducibility of polynomial maps.

by

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Abstract

In this paper, a proof of Rouché's Theorem for irreducible polynomials is presented using the unit circle as our closed curve under consideration. It will be noted that, use is made of the Fundamental Theorem of Algebra just as it is well known that the Fundamental Theorem of Algebra can also be proved using Rouché's Theorem. Thus, one may rightly view this paper as establishing that Rouché's Theorem for polynomial maps is equivalent to the Fundamental Theorem of Algebra. (i.e. that each is easily derivable from the other.)

Keywords: argument, irreducible, multiplicity of zeros, poles, unit circle.

Pages 21 – 22

5)

**Number of fixed point free element in the subgroup of
orientation reversing mappings**

by

Bashir Ali

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Abstract

Let ORD_n be the subgroup of all orientation reversing bijective mappings of n -element set. It is shown that for m even: if $m = 2k + 1$, then $\rho_m \in ORD_n$ has no fixed point. And if m is odd there are exactly $n/2$ derangements.

Keywords: Permutation, derangement, symmetries, full transformation, partial transformation, partial one-one transformation.

Pages 23 – 26

6)

**Some results on the generalized projection and asymptotic
operators**

by

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Keywords: Asymptotic Operators, Contractive and Suppressive mappings, fixed point, Generalized projection, Ishikawa iteration, uniformly convex and uniformly smooth Banach spaces.

2000 Mathematics Subject Classification: 47H04, 47H06, 47H10, 47J05, 47J25.

Pages 27 – 30

7)

On the isomorphism of $\text{aut}(\mathbb{Z}_n)$, U-group $U(n)$ and permutation group $U(n)^*$
by

H. Praise Adeyemo

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University of Ibadan, Nigeria.

Abstract

In this paper, we compute $\text{Aut}(\mathbb{Z}_n)$ and U-group, $U(n)$ and establish that these groups are isomorphic and give the systematic construction of the permutation group, $U(n)^*$ which is isomorphic to $U(n)$. Hence we establish the isomorphism of $\text{Aut}(\mathbb{Z}_n)$, U-group $U(n)$ and Permutation group $U(n)^*$. We consider only when $n = 20$.

Pages 31 – 34

8)

Computational analysis of the Van der Pol equation using the Krylov-Bogolobov technique
by

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Department of Mathematics and Computer Science
Federal University of Technology, Minna, Nigeria

Abstract

Analysis of non-linear equations has been a very difficult aspect of mathematics. This paper ventures into the specifics of Van Der Pol equation as related to the use of perturbation method of its analysis, finally employs the Krylov-Bogolobov techniques. Our purpose here is to describe the main features of the method of asymptotic expansion an example, that of Van Der Pol equation.

Pages 35 – 38

9)

Derivative of biconfluent Heun's equation from some properties of hypergeometric function

by

A. Anjorin

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Lagos State University, Lagos, Nigeria.

Abstract

The paper determines the solutions derived from the transformation of some confluent Heun's equation to hypergeometric equations by rational substitution. We show that the derivative of the original solution of the transformed confluent form of Heun's equation can be expressed in terms of another solution of the confluent form.

Pages 39 – 40

10)

On coefficients in the partial fractions of some trigonometric and exponential functions

by

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Abstract

Several works have been done in this area including Daniel S. and Tella Y. [2]. In this paper, we consider resolving rational functions containing trigonometric and exponential functions in their denominators into the sum of its partial fractions equivalent where all the unknown constants and coefficients are obtained by recursive method; an extension of [2]. Also, a general formula for obtaining these coefficients as n tends to infinity is obtained.

Pages 41 – 48

11)

Recursive backstepping design for controlling chaos of three nonlinear Bloch equations.

By
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Department of Physics,
Tai Solarin University of Education,
Ijebu–Ode, Nigeria.

Abstract

Recursive backstepping nonlinear control technique has become a powerful tool for controlling and synchronizing chaotic systems, because backstepping enhances global stability. The purpose of this study is to make use of recursive backstepping technique in controlling chaotic dynamics and attractors generated by dynamic states of three nonlinear modified Bloch systems described with different values of system constants and initial conditions. Numerical simulations are performed to verify that the three controllers achieve the control goals for the three dynamic states equations.

Keywords: Chaos control; Nonlinear Bloch Equations; recursive backstepping control.

Pages 49 – 54

12)

**On the numerical solution of the Gross-Pitaevskii equation for
an isolated vortex in trapped gas**

By

J. A. Laoye and S. O. Kareem*
Department of Physics, Olabisi Onabanjo University,
Ago-Iwoye, Nigeria

Abstract

In this paper, the solution of the Gross-Pitaevskii equation is obtained numerically and the spread of the boson molecules in the vortex examined. In our study, we considered the attractive interaction for which the coupling constant is negative and the vortex is generated in harmonic potential. Our results show that, for attractive interaction, the boson molecules spread out from the centre of the vortex as the strength of the interaction increases.

Keywords: Bose-Einstein condensation; Vortex; Harmonic potential

Pages 55 - 58

13)

**Improved continuous method for direct solution of general
second order ordinary differential equation**

by

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³Department of Mathematics and Statistics,
Cross River State University of Technology, Calabar, Nigeria.

Abstract

In this paper a numerical method of solving general second order initial value problems with step length $k = 4$ is developed. The approach is based on the collocation of the differential system and interpolation of the approximate solution. Some predictors for calculating the unknown in the corrector were also derived. The efficiency of this scheme was tested with some numerical examples.

Keywords: Collocation, interpolation, approximate solution, predictors, correctors, step length.

Pages 59 – 62

14)

**One-leg multistep methods for the numerical integration of
periodic second order initial value problems**

by

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University of Lagos, Akoka, Lagos, Nigeria.

Abstract

The need to develop some efficient schemes that is suitable for second order initial value problems in ordinary differential equations is of interest. We observe that some second order differential equations do exist that will not contain the first derivative of the dependent variable in the equation. Such equations may be highly oscillatory or periodic in nature and require some efficient algorithms in terms of accuracy and stability. This paper discusses some one-leg methods that are suitable for such problems.

Keywords: One-leg, twin- multistep, Periodic, stability

Pages 63 – 68

15)

**On delay-type behaviour of thermal explosion in a combustible gas
mixture containing fuel droplets with Arrhenius power-law model**

By

K. S. Adegbe
Department of Mathematical Sciences

Abstract

The problem of thermal explosion in combustible gas mixtures containing fuel droplets is extended to permit a more general temperature dependent rate of reaction for most typical practical reactions based on Arrhenius equation under physically reasonable assumptions. A detailed numerical analysis of the resulting system of coupled non-linear ordinary differential equations is performed to account for numeric exponent effects relating to most typical practical reactions such as sensitized, Arrhenius and bimolecular reactions respectively. The computed results reveal different dynamic delay-type behaviours and are illustrated graphically in this study.

Pages **69 – 82**

16)

On a differential and integral characterization of real-valued convex functions of several variables

by

P. E. Ezimadu and J. N. Igabari

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Delta State University Abraka

Abstract

Convex functions play important roles in the study of optimization. These functions have many important properties which can be used to develop suitable optimality conditions and computational schemes for optimization problems. With a growing need for deeper understanding of these properties comes the need for a wider definition of convex functions. In this work we present a characterization of real valued convex functions of several variables through the derivative and integral. This characterization provides an equivalence for the definitions of convexity.

Keywords: Convex Functions, Convex Sets, Monotone Mapping

Pages **83 – 86**

17)

Oscillation in solutions of stochastic delay differential equations with real coefficients and several constant time lags

by

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²Department of Mathematics University of Ibadan, Nigeria.

Abstract

We study the role played by multiplicative noise perturbation in the oscillatory and non-oscillatory behaviour of the solution of first order linear scalar stochastic delay differential equation (SDDE)

$$dX(t) = \left[aX(t) + \sum_{i=1}^n b_i x(t - r_i) \right] dt + \mu X(t) dB(t),$$
$$t \geq 0 \quad X(t) = \psi(t), \quad t \in [-r, 0]$$

We explain the interplay between the time lags and the multiplicative noise in the oscillatory behaviour of the solutions of the SDDE. It is proved that the presence of the multiplicative noise ensures that all solutions of the SDDE oscillate under negative feedback even if its corresponding deterministic equation has a non-oscillatory solution.

Keywords: Stochastic delay differential equation, oscillation, non-oscillation, noise perturbation.

Pages 87 – 94

18)

On a stochastically imperfect quadratic-cubic column pressurized by a random dynamic load

by

A. M. Ette

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Federal University of Technology, Owerri, Imo State

Abstract

This investigation explores the dynamic stability of a randomly stochastic viscously damped finite imperfect column lying on a quadratic-cubic nonlinear elastic foundation but trapped by a dynamically random load applied just after the initial time. Non-vanishing statistical means and autocorrelations of both the imperfection and dynamic load are assumed. In particular, the autocorrelation of the imperfection is assumed to be correlated as an exponentially decaying function of the space variable. The statistical mean of the normal displacement is determined and is assumed to be a suitable parameter for determining the dynamic buckling load. The dynamic buckling load is determined asymptotically and various deductions are made. The result is particularized to that of a finite column on a purely cubic nonlinear elastic foundation.

Pages 95 – 104

19)

Time-dependent random forcing and buckling of a damped finite column on non-linear elastic foundations

by

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Federal University of Technology
Owerri, Imo State

Abstract

This paper is concerned with time-dependent random vibrations and dynamic buckling of a finite deterministically imperfect column resting on “softening” nonlinear (cubic) elastic foundations but trapped by a stochastically random, zero-mean, time-dependent load. The random load is imbued with certain statistical characterizations including a correlated exponential cosine autocorrelation which confers some form of randomness on the response statistic. Assuming the mean square lateral displacement to be a suitable statistical characterization of the random response, the dynamic buckling load of the nonlinear structure is determined asymptotically via regular perturbation procedures.

It is found out that the dynamic buckling load is of order $R_0^{-\frac{1}{2}}$, where R_0 is the variance of the random load. It is also established that the value of the dynamic buckling load, in the case where the buckling modes are strictly in the shape of imperfection, is less than its value in a similar case where the buckling modes are not strictly in the shape of imperfection.

Pages 105 – 118

20)

Effects of damping and exponentially decaying foundation on the motions of finite thin beam subjected to travelling loads

by

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Abstract

The dynamic response of a finite elastic thin beam to fast moving heavy concentrated forces is investigated. The beam is assumed to be under tensile stress and have simple supports at both ends. Furthermore, the beam is assumed to rest on elastic foundation

of the exponential rigidity and the moving concentrated forces is assumed to move with constant velocity type of motion. The fourth order partial differential equation governing the flexural motions of the elastic systems is solved using mode superimposition and Integral transform method and the closed-form solutions to this beam problem is obtained. Effects of some beam parameters on the response of the beam are classified. Results presented both analytically and numerically in this paper are readily applicable in engineering design and analysis and for further investigation in structural dynamics.

Keywords: Dynamic response, Concentrated forces, Exponential rigidity, Flexural motions, Beam parameters

Pages 119 – 126

21)

Influence of prestress on the response to moving loads of rectangular plates incorporating rotatory inertia correction factor.

by

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Federal University of Technology, Akure, Nigeria.

Abstract

In this paper, the influence of axial force on the dynamic response to moving concentrated masses of rectangular plate incorporating rotatory inertia correction factor is investigated. The solution technique is based on the versatile two-dimensional generalized integral transform with the normal modes of the plate as the kernel of transformation and a modification of the Struble's asymptotic technique. The closed form solutions are analyzed and numerical analyses in plotted curves are presented. The results show that as the axial force (prestress), N_x and N_y , foundation moduli K and rotatory R_o increase, the response amplitudes of the dynamic system decrease for both illustrative examples. However, higher values of N_x , N_y , K and R_o are required for a more noticeable effect in the case of simple-clamped boundary conditions than those of simply supported boundary conditions. Furthermore, for the same natural frequency, the critical speed for the moving mass problem is smaller than that of the moving force problem. Hence resonance is reached earlier in moving mass problem.

Pages 127 – 140

22)

Transverse vibration under a moving load of a highly prestressed isotropic rectangular plate on a bi-parametric subgrade

by

S. T Oni and O. K Ogunbamike

Abstract

This paper investigates the dynamic response of a highly prestressed isotropic rectangular plate resting on a bi-parametric subgrade under the action of a moving load. Using the singular perturbation technique, specifically the Method of Matched Asymptotic Expansion (MMAE), in conjunction with the method of integral transformations and Cauchy Residue theorem, a uniformly valid analytical solution in the entire domain of definition of the rectangular plate is obtained. Analyses of analytical solutions and numerical results show that the leading order solution and the first order correction are affected by the bi-parametric subgrade and anisotropic prestress to the response of $O(\epsilon^1)$ of the rectangular plate. It is also found that the critical velocities of the dynamical system increase with prestress for all values of shear modulus and foundation stiffness used. Thus, resonance is reached earlier for lower values of prestress, shear modulus and foundation stiffness than for high values.

Pages 141 – 160

23)

Acoustic wave in viscous fluid

by

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Abstract

This discussion is concerned with an acoustic wave in a viscous Newtonian fluid and examines the wave equation in this case. The governing partial differential equations for the wave are derived using the Navier-Stokes momentum equation, the equation of continuity (assuming an adiabatic equation of state) and the acoustic wave condition. One advantage of this formulation is that the wave equation is expressed in a form suitable for finite difference time domain discretization. The formulation shows that, in general, acoustic wave propagation in a viscous fluid is associated with both shearing (tangential) and non-shearing (normal) viscous forces, which account for dissipation of wave energy in the medium. In a liquid or for a plane acoustic wave the non-shearing (normal) viscous force is the dominant contributor to wave energy dissipation.

Keywords: acoustic wave; viscous loss.

Pages 161 – 166

24)

Linear stability analysis of a radiating fluid layer with temperature-dependent viscosity heated from below

by

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^bDepartment of Physics, Rivers State College of Education, Port Harcourt.

Abstract

Experiments with fluid whose viscosity depends on temperature are used to study the effect of viscosity variations. At large viscosity, Rayleigh number can either be conductive or convective depending on whether the Rayleigh number is high or low or decreased from a pre-existing convective state. At high Rayleigh numbers and for the entire range of viscosity variation, the stability occurs at $Ra_{cri} = 407.70$. From the viscous fluid when the Rayleigh is defined in terms of wave number corresponding to a temperature equal to the average of the boundary temperatures. The relationship between critical Rayleigh number and the temperature appears not to depend on the Rayleigh number.

Pages 167 – 172

25)

Shear fields in a material weakened by cracks at the boundary of a hole

by

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Department of Mathematics
Abia State University, Uturu, Nigeria

Abstract

A sheared elastic material containing a central hole and two cracks has been investigated. One of the cracks propagated from a far distance and terminated at the hole which acted as a crack breaker. The other one originated from the boundary of the hole opposite the one of infinite extent and moved a finite distance, $b-a$, where a is the radius of the hole. The fields close to the tip of the finite crack were derived in terms of the complete elliptic integral of the first kind. The stress intensity factor, $K_{III}(b-a;T)$ was derived in the standard form and is comparable with known stress intensity factor, $K_{III}^0(a;T)$ for a tunnel crack of width, $2a$ under remote shear stress. The dependence of

$K_{III}^N(b-a;T) = \frac{K_{III}(b-a;T)}{K_{III}^0(a;T)}$ on the ratio $\frac{a}{b}$ was displayed in a graph.

26)

**Mathematical model for flow around two-dimensional aerofoils
at small angles of attack**

by

***U. D. Akpan and **A. E. Eyo**

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University of Uyo, Uyo, Nigeria.

Abstract

The sole aim of this work is to develop a mathematical model for calculating certain parameters like velocity, angle of incidence, lift coefficient and geometric characteristics like maximum thickness and camber for both same and related aerofoils using Prandtl-Glauert [1, 2] and Gothert [3] similarity rules. The model is extended to include pressure at any point on the aerofoil profile as well as other geometric characteristics like chord, wing area and span. Applying the model to a numerical example, based on flight problem, these parameters are determined in compressible flow and compared with those in incompressible flow. Furthermore, the model which includes ratios of geometric characteristics of aerofoil like thickness/chord ratio and camber/chord ratio is extended to include wing area/span ratio, and these parameters are also determined in the example and compared for both same and related aerofoil.

Keywords: Mathematical model, two-dimensional aerofoils, similarity rules, small angles of attack.

Pages 179- 182

27)

**A coupled mathematical model for a temperature dependant
blood perfusion in a homogenous biological tissue during
microwave heating.**

by

***E. A. Adebile, B. N. Akintewe. and K. M. Owolabi**

Department of Mathematical Sciences
Federal University of Technology, Akure, Nigeria

Abstract

The steady state temperature field of a homogenous biological tissues is discussed when the blood perfusion is temperature dependant. The solution to the steady Maxwell equations provoke a two regional compartments. Our solution is obtained for the

temperature field using an adequate matching condition at the interface of the two regions. The results revealed the effects of varying blood perfusion, tissue thickness, Electric field and the matching temperature on the temperature pattern in the tissue. Great care is needed before treatment and modality is administered.

Keywords: Homogenous, Biological tissues, Blood perfusion, Microwave Heating, Temperature dependent

Pages 183 -188

28)

Approximate solution to laminar falling liquid film with variable viscosity along an inclined heated plate

by

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²Department of Mathematical Sciences,
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Abstract

This paper examines the steady-state solution of a laminar falling liquid film with variable viscosity along an inclined heated plate. The existence and uniqueness of solution to this problem was investigated and it was found that the problem has a unique solution. Numerical solution via shooting techniques were employed in tackling the non-linear coupled momentum and energy balance equations. The Brinkman number (λ) and variable viscous parameter (β) play a prominent roll in the construction of the numerical solution. The velocity and temperature profile of the liquid film are displayed in graphs.

Keywords: Numerical solution, laminar, viscosity, film, steady-state.

Pages 189 – 192

29)

Viscous dissipation effect on the flow through a very porous media

by

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²Department of Applied Science, Kaduna Polytechnic, Kaduna

Abstract

In this paper we present similarity solutions to the flow of fluid through a very porous media bounded by a semi-infinite horizontal plate with viscous dissipation effect. The effect of Prandtl Number and permeability parameter are considered. It is observed that as the permeability parameter increases the dimensionless temperature decreases, it is also observed that the dimensionless temperature also increase with a decrease in the Prandtl number.

Pages 193 – 196

30)

Viscous dissipation effect on the hydro-magnetic flow through a very porous horizontal plate

by

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Abstract

We analyse heat transfer characteristics of a steady hydro-magnetic flow in a horizontal plate. The effect of the Darcy number, Hartmann number and the Brickman number were effectively determined. Results obtained shows that there is an increase in temperature as the Hartmann number increases and an increase in the Darcy number leads to a decrease in the temperature.

Pages 197 – 200

31)

Effects of variable viscosity on MHD boundary layer flow on a continuously moving vertical plate in the presence of radiation and a chemical reaction of order 1

by

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²Emmanuel Alayande College of Education,
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Abstract

This work presents a study of the flow and heat transfer of an incompressible viscous electrically conducting fluid over a continuously moving vertical infinite plate with uniform suction and heat flux in the presence of radiation and a chemical reaction of order 1 taking into account the effects of variable viscosity. It is found that the velocity increases as the viscosity of fluid or the magnetic parameter decreases and the thermal boundary layer thickness increases as the radiation parameter increases. The skin-friction coefficient is computed and discussed for various values of the parameters. A parametric study was conducted and reported.

Keywords: MHD, variable viscosity, radiation.

Mathematics Subject Classification: 76W05

Pages **201 – 210**

32)

MHD flow of a uniformly stretched vertical permeable surface under oscillatory suction velocity

by

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²Department of Physical Sciences,
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Abstract

The study of unsteady magnetohydrodynamic heat and mass transfer in MHD flow of an incompressible, electrically conducting, viscous fluid past an infinite vertical porous plate along with porous medium of time dependent permeability under oscillatory suction velocity normal to the plate has been made. It was considered that the influence of the uniform magnetic field acts normal to the flow and the permeability of the porous medium fluctuate with time. The problem is solved, analytically by asymptotic expansion in order of epsilon for velocity, temperature and concentration fields. The results obtained are discussed for thermal Grashof number ($Gr_T > 0$) corresponding to the cooling of the plate and ($Gr_T < 0$) corresponding to heating of the plate with the help of graphs to observe the effect of various parameters. A parametric study of all parameters involved was considered, and a representative set of results showing the effect of heat generation, reaction parameter, grashof numbers Hartmann number and free stream oscillatory frequency were illustrated.

Keywords: Mass transfer, MHD flow, vertical plate, suction velocity, viscous, oscillatory, Grashof number, permeable surface.

Classification: 76W05

Pages **211 – 220**

33)

Steady flow of reacting temperature-dependent fluid past an impulsively started porous vertical surface with Newtonian heating

by

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²Department of Pure and Applied Mathematics, Ladoke Akintola University of Technology, Nigeria.

Abstract

This paper studies the steady flow of a reacting temperature-dependent viscous incompressible fluid past an infinite vertical porous plate, with the flow generated by Newtonian heating and impulsive motion. The resulting momentum equation is non-dimensionalized and the solution is obtained numerically by shooting method. A parametric study of all involved parameters is conducted and illustrated graphically.

Keywords: Reacting fluid, temperature-dependent, heat transfer, Newtonian heating.

Pages **221 – 226**

34)

Application of thermo-acoustic engines to heat transfer in microcircuits: An analytical approach

by

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Federal University of Technology, Minna, Nigeria.

Abstract

As a result of miniaturization, electronic products are shrinking in size and weight but with greater pressure for cost reduction. Heat fluxes have increased considerably and hence thermal management becomes crucial from the reliability point of view. This paper presents an analytical model of heat transfer in microcircuits. The analytical solution is obtained for temperature field of the fin. It is shown that the minimum temperature of the fin decreases as both time and convection coefficient increases and thermal conductivity decreases.

Keywords: heat transfer, engines, microcircuit, variable separation

Pages **227 – 230**

35)

Effect of power-law exponent in endothermic reactions

by

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Ladoke Akintola University of Technology, Ogbomoso, Nigeria

Abstract

We present the solutions of a steady Arrhenius endothermic reaction. We reduced the exponential term to a power-law approximation. We solved the problem by using shooting method technique. It is shown that the heat generated by the endothermic reaction depends on the power-law exponent. The minimum temperature increases as the power-law index α increases, whereas the minimum temperature decreases as the Frank-Kamenestkii parameter β increases.

Pages 231 – 234

36)

Solitons of flexural deformation of the basilar membrane

by

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Ebonyi State University, Abakiliki, Nigeria

Abstract

Solitons are very stable solitary waves in a solution of the plate equation obtain from the three dimensional equations of the linearized director theory for an elastic body (the basilar membrane) which were solve and solution shows solitons. We show that the solitary waves behave like particle. When there are located mutually far apart, each of them is approximately a travelling wave with constant shape and velocity. The stability of the solitons stems from the delicate balance of “nonlinearity” and “dispersion” in the model equations. Nonlinearity drives a solitary wave to concentrate further; dispersion is the effects to spread such a localized wave. In this exhibition, we present equation of soliton phenomena along with soliton solution.

Pages 235 – 242

37)

Effect of noise on the level of hearing

by

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Ebonyi State University, Abakaliki, Nigeria.

Abstract

Mathematical models describing the effects of noise on the level of hearing were formulated. It is shown that sound above 85dB affect the position or orientation of the Hair Cells on the basilar membrane in the inner ear. This change in the orientation of HC affects the ionic exchange at the foot the HC. This allows the release of neuron transmitters, which set up potentials that will transmit impulse to the auditory nerve. The noise so received and transmitted as impulse signal to the auditory nerve is sent to the hypothalamus section of the brain, for interpretations

Pages 243 – 252

38)

A new analytical solution to the optimal control problem for the control of higher-order non-dispersive wave

by

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²National Open University of Nigeria,
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Abstract

The explicit expressions of the functions: $z(x,y,t)$ and $u(x,y,t)$ were obtained in this paper. These two functions are known as the state and the control variables for the optimal control model of higher order nondispersive wave equation. They are indispensable in the implementation of the model using the extended conjugate gradient method [2].

Keywords: optimal control, maximum principle, state variable, control variable

Pages 253 – 260

39)

Relative controllability of neutral functional differential systems with nonlinear base

by

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Federal University of Technology, Owerri, Nigeria

Abstract

In this paper, sufficient conditions are established for the relative controllability of a special class of nonlinear neutral systems in which the base is strongly nonlinear and with time varying multiple delays in control. The results are established by using the Schauder fixed point theorem.

Keywords: Controllability, neutral functional differential system, nonlinear base, multiple delays, Schauder fixed point theorem.

Pages 261 – 266

40)

Asymptotic null controllability of nonlinear neutral volterra integrodifferential system with delays in control

by

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²Department of Mathematics/ and Statistic, University Of Port Harcourt,
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Abstract

In this paper by using Larry-Schauder's fixed point theorem, we; obtained sufficient conditions for the asymptotic null controllability of nonlinear neutral volterra integrodifferential system.

Keywords: Asymptotic null controllability, volterra integral system, Larry-Schauder's fixed point theorem.

Pages 267 – 272

41)

Design of provably secure cryptographic hash functions

by

Tola John Odule,

Department of Mathematical Sciences

Abstract

It was shown in this paper that the size w of the internal hash values is a security parameter of its own right, with $w \geq n$ but otherwise independent from the final hash size n . Given “good” compression functions, this paper shows how to compose “good” hashes. Though the random oracle model is quite useless to define what it means to be a “good” compression function [6], the given lemmas provide some specific requirements for the compression functions.

Keywords: Hash function, Adversarial attack, provable security, Ideal model

Pages 273 – 280

42)

Dynamic hashing algorithm for searching time-series databases

by

Tola John Odule,

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Abstract

Sequence data searching using the Euclidean distance between two sequences as the only criterion for similarity suffers from some deficiencies: It is sensitive to the vertical positions of the two sequences and so is not a good measure of similarity in terms of their shapes. We propose a new definition for similarity that overcomes these deficiencies. A fast searching algorithm based on dynamic hashing, which guarantees that no qualified data subsequence similar to the query sequence will be falsely rejected, is also proposed. The algorithm can also find data subsequences similar to the query sequence with different scaling factors in both amplitude and time dimensions. Several experiments were performed to evaluate the proposed algorithm using both synthetic and real data (stock price movement).

Keywords: Euclidean distance, hashing, time-series, sequence similarity, statistical noise.

Pages 281 – 288

43)

Comparative analysis of Rivest Shamir Adleman (RSA), Rabin and El Gamal public key cryptosystems

by

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Abstract

Eavesdropping is as old as human race. The ever increasing dependence on the use of computer and the telecommunications technology (ICT) has heightened the desire to protect and preserve the integrity of networks. This takes the challenge to the level of security. This paper attempts to conduct a comparative analysis of the three public key cryptosystems (RSA, Rabin and El Gamal) that are thought to be secure. Each of the cryptographic schemes is appraised with a view to exposing their strengths and weaknesses. A platform is considered in the paper for the schemes based on some denominators for indepth comparisons.

Keyword: Cryptosystem, Security, Eavesdropping, Networks

Pages 289 – 296

44)

Simulation of the performance of photovoltaic system using heliophysical variables

by

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Federal University of Technology, Akure, Nigeria.

Abstract

A method of simulating the long-term average performance of photovoltaic systems based on the observed time series of some heliophysical variables was developed and explored in this research. The data used were the sunshine duration and solar radiation intensity for years 1990 to 2004 for eleven Nigerian stations namely Calabar, Ibadan, Ilorin, Kaduna, Kano, Lagos, Lokoja, Maiduguri, Minna, Sokoto and Zaria obtained from the archives of the Nigeria Meteorological Agency, NIMET. Appropriate programs were developed using Matlab^R code to model the performance of a photovoltaic system. Input parameters which were estimated from the obtained heliophysical variables and used in the simulation were clearness index and total radiation on an inclined surface. The output parameters include utilizability, monthly-average fraction of the load covered by the photovoltaic system with battery storage, monthly-average fraction of the load covered by the photovoltaic system without battery storage and the increase in the solar load fraction due to storage. Solar load fraction with storage gotten from this work ranges between 27.2% and 28.2% conversion efficiency of solar cell. Maximum incident solar radiation onto the photovoltaic array is obtainable in dry season which lead to better performance of photovoltaic electrical output and lower values of utilizability either when the excess solar load fractions are being stored or not. Minimum incident solar radiation onto the photovoltaic array is also obtainable in wet season which lead to poor

performance of photovoltaic electrical output and higher values of utilizability either when the excess solar load fractions are being stored or not.

Keywords: photovoltaic systems, utilizability, performance, atmospheres

Pages 297 – 304

45)

The performance of FPE for the maximum entropy estimation method

by

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Abstract

The performance of FPE_{α} , as defined by Bhansali and Downham (1977) is investigated here for $\alpha = 1, 2, 3, 4$ and for the maximum entropy method of autoregression estimation. Here it is demonstrated using both artificial and real series that the optimum α is between 2 and 4, inclusive.

Keywords: Autoregressive modeling, FPE, maximum entropy method.

Pages 305 – 308

46)

The performance of inverse autocorrelation function in model order determination especially with outliers.

by

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Abstract

Noting that the effect of outliers in model order determination could be serious, this paper is concerned with the problem of examining the performance of inverse autocorrelation function in model order determination especially with outliers. Tsay (1986) iterative procedure was used to identify the outliers, remove their effects and then specify a tentative model using the inverse autocorrelation function. An example is also presented.

Keywords: Inverse autocorrelation function; outliers; model order determination.

47)

Physical model of income distribution

by

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Abstract

In this study, a self-organized model was developed to demonstrate the inequality of income distribution. We assumed that income depends on two quantifiable parameters, namely, work and potential. Since every member of a population (or every nation) is free to decide how much work he/she will do, we model work by a random variable, called, the work index. The potential of each member of the population depends on biological (skill, intelligence), social and economic factors. For a state, the factors that affect the potential include the quality and quantity of a country's stock of the factors of production, technical knowledge, natural resources etc. In this model, a basic computer program was developed to compute the income distribution among population sample of 27. The results show that the wealth increases exponentially with the potential. Work however, has a linear relationship with potential; hence, the acquired resources also depend exponentially on work. There is no relationship between the initial potential, the final potential, and the final wealth. The model shows that although work is very important in the final potential and wealth, the time of work is more important to avoid lasting poverty.

Pages 315 – 320

48)

Optimality of MRPP policies for inventory problem with stochastic demand

by

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Abstract

Material requirements and production planning (MRPP) is absolutely an essential activity which holds some form of detail lists in any production industry. This paper addresses a discrete time inventory problem when the demand for finished products is a random variable. Policies that make material requirements and production planning optimal are

presented. Data from a typical plastic industry are analysed to evaluate the performance of MRPP, and quick response time is recommended.

Keywords: Inventory Models, Stochastic Demand, Material Requirements, Cost Control, Probability.

Pages 321 – 324

49)

Batch arrival discrete time queue with server vacation

by

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Abstract

A class of single server vacation queues, which have batch arrivals and single server, is considered in discrete time. Here the server goes on vacation of random length as soon as the system becomes empty. On return from vacation, if he finds any customers waiting in the queue, the server starts serving the customers one by one until the queue size is zero (the queue discipline is FIFO); otherwise he takes another vacation and so on. The vacation model we consider here is the ungated system i.e. exhaustive system. It is shown here that the interarrival, service, vacation and server operation time can be cast with markov based representation then this class of vacation models can then be studied as matrix-product problem which belongs to a class of matrix analytic family- thereby allowing us to use result from Alfa (2003) to solve the resulting matrix product problem. Most importantly it is shown that using discrete time modelling approach to study some vacation model is more appropriate and makes the model much more algorithmically tractable.

Keywords: Batch Arrival, Discrete time model, matrix product problem, vacation queues.

Pages 325 – 330

50)

Mathematical application of time study model in a glass company

by

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Abstract

This paper presents a case study in the development and application of a time study model in a glass manufacturing plant. The organization engages in the production of different types of glass wares which are versatile and enigmatic. The motivation for this study was the need to intervene in frequent crises that normally arose between the employee-association and the management of the company regarding questions of productivity. The mathematical model was developed with the application of differential calculus to the elements of the production systems that have significant effect on the production output from the system. Our model incorporates some uncontrollable factors such as irregular supply of electricity, unavailability of raw materials as well as excessive machine breakdown due to old age. The study is however considered to be very beneficial to practicing managers in the industries and is therefore recommended for use.

Keywords: Time Study Model, Production System, Production Output, Uncontrollable Factors.

Pages 331 – 336

51)

A measure of confidence for examination process

by

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Abstract

The zeal of candidates to pass examinations at all costs in order to progress in their educational pursuit or gain undue advantage over others has resulted to examination malpractice. To curb this, new strategies for examination have evolved over the years. In this study, we derive mathematical models to measure the level of confidence on the effectiveness of new strategies that are being introduced to remedy examination malpractice. The model is extended to the case where the previous strategies are claimed to be effective. The methods presented in this paper have the advantage of summarizing in one figure the confidence level on examination process.

Keywords: beta function; confidence level; gamma function; examination; estimate.

Pages 337 – 342

52)

Application of mathematical models to educational planning: A review

by

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Abstract

This paper offers critical evaluation of previous works relevant to educational planning, school choice modelling and mode choice of student travel to school. In the review, the practical relevance of existing models is reported as well as the roles played by exploratory and normative models. The purpose of this paper is to give educational planners a realistic appraisal of the previous and current practice in educational planning, school choice modelling and mode choice of student travel and to provide pointers to areas where further research are needed.

Keywords: educational planning; log-normal model; manpower planning; mathematical model; multinomial logit model.

Pages 343 – 350

53)

First-principles study of structural and electronic properties of GaP and InP

by

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Abstract

The full-potential linearized augmented plane wave method (FP-LAPW) within the generalized gradient approximation (GGA) is used to calculate the structural and electronic properties of zinc blende GaP and InP. In this approach we obtained ground state properties such as equilibrium lattice constants, bulk modulus and its pressure derivative which are in good agreement with previous results. However our study shows that the GGA underestimates the energy band gap of both semiconductors.

Keywords: Full-Potential Linearized Augmented Plane Wave (FP-LAPW), Density Functional Theory (DFT), Generalized Gradient Approximation (GGA)

PACS: 71.15. Ap; 71.15.Mb; 71.15.-m

Pages 351 – 356

54)

Calculations of total energy in the density functional theory using FHI98MD code

by

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Abstract

We have computed total energy for Al, Si, Ga, and As in the framework of density-function theory within LDA approximation by using the Williams-Solar minimization scheme to iterate the wave functions. Different values for the electronic time step, Δt , an energy cutoff, E_{cut} and damping parameter, γ are used. The Monkhorst-Pack k-point mesh was taken as $4 \times 4 \times 4$ with the initial k-point $(0.5, 0.5, 0.5)$. E_0 is the well-converged value of the total energy approached. Each computation gives an optimal convergence for all the four elements.

Pages 357 – 362

55)

Einstein's equation of motion for a photon in fields exterior to astrophysically real or imaginary spherical mass distributions whose tensor field varies with azimuthal angle only

by

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Abstract

The metric exterior to an astrophysically real or hypothetical spherical mass distribution whose tensor field varies with azimuthal angle only is used to study the motion of a photon in this gravitational field. The general relativistic equation of motion for a photon moving round this spherical distribution of mass is derived. The second-order differential equation obtained differs from that in Schwarzschild's field.

Keywords: equation of motion, astrophysical, spherical, mass, photon, tensor field, azimuthal angle

Pages 363 – 366

56)

I–electrophoresis of deoxyhemoglobin S: Theoretical study of the deformation induced by the applied field and the mechanical stresses

by

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Abstract

A more efficient technique for the study of red cell is electrophoresis. More precisely, if a constant external field is applied to a protein, the later migrates to anode or cathode according to his net charge. Compared to Hemoglobin A (HbA) which is the normal constituent, it was observed that Hemoglobin S (HbS) have a charge difference which is due to a genetic mutation $\beta 6(A3) Glu \rightarrow Val$, and consequently, a less anodic migration [1]. For the patients with HbS disease, the red cell instead to stay binocave takes the sickle form when there are deoxygenated. This deformation leads to the vaso-occlusives crisis very painful which can provoke different lesions in organelles [2]. In this work, we paid our attention on a particular phenomenon, viz, the account of the deformation which result exclusively from the conjugated action of the applied field and the mechanical stress acting on the deoxy-HbS during the electrophoresis process. In these conditions, a molecule of deoxy-HbS which is not deformed is considered as a dielectric sphere with dielectric constant ϵ_o while a defined HbS molecule is considered as a dielectric ellipsoid of revolution with dielectric constant ϵ_i along the j axis where the field is applied. The results obtained clearly indicate that the deformation ζ is an analytical function of the form: $\zeta = f(E, \mu, \epsilon_o, \epsilon)$ where E is the electric field intensity, μ the slide modulus of the molecule, and ϵ

Keywords: Hemoglobine S, Electrophoresis, Deformation, Critical Value

Pages 367 – 372

57)

II–electrophoresis of deoxyhemoglobin S Theoretical study of the volume variation and electrocalorific effect

by

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Abstract

In the first part of this work by Olatunji and Ayeni [1], we consider the deformation of HbS molecule without volume variation during the electrophoresis process. In this second part, we consider the inverse case where the ellipsoid do not change the form

but only his volume changes. We also consider the induced electro calorific effect. The results obtains are:

$$V - V_0 = \frac{VE^2}{8\pi} \left[\left(\frac{f}{g} \right) \beta_x - \frac{h\beta_x(\epsilon_x - 1)(\epsilon_x + 2) + k\beta(\epsilon - 1)(\epsilon + 2)}{3g^2} \right]$$

$$Q - Q_0 = \frac{TVE^2}{8\pi} \left[\left(\frac{f}{g} \right) \chi_x - \frac{h\chi_x(\epsilon_x - 1)(\epsilon_x + 2) + k\chi(\epsilon - 1)(\epsilon + 2)}{3g^2} \right] \text{ where } \beta_x \text{ and } \chi_x \text{ are the}$$

isothermal coefficient of compressibility and the coefficient of thermal dialation of the molecule, β and χ the corresponding coefficients for the solvent. (f,g,h,k) are analytical functions which depend on dielectric constants and coefficient of depolarization A_x .

Keyword: Hemoglobin S, Volume Variation, electrocalorific Effect

Pages 373 – 376

58)

Non linear dynamic equation for deoxyhemoglobins aggregation: A phenomenological approach

by

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Abstract

In a previous work Dejardin and Olatunji [1], a mathematical model is derived for the kinetics of the Deoxyhemoglobin S (deoxy-HbS). The analytical function $A(t)$ obtained for the time evolution of the absorbance measured in turbidity, satisfactorily fits the experimental data of Poyart et al [2]. In the present paper, starting with the function $A(t)$, we used a phenomenological approach to derive a nonlinear dynamic equation for the aggregation of deoxy-HbS. Every parameter of the governing equation can be assigned a clear physical meaning. Moreover, drawing on the work of Quemada [3], we introduced in the parameters base a scalar structural parameter $\lambda(t, x)$ which depends on the time t and on a set of controlling factors denoted x Furthermore, the set of controlling factor x can be limited to, say, the volume fraction ϕ , a constant shear rate $\dot{\gamma}$, the deoxy-HbS concentration c , the temperature T , and other factors which influence the aggregation dynamics. In this paper, we developed the solution of the governing equation under steady conditions and applied the results to some rheological properties of deoxy-HbS gel.

Keywords: Deoxyhemoglobin S aggregation, Nonlinear dynamic equation, Steady properties of HbS gel.

Pages 377 – 386

59)

Egyptian fractions and practical numbers

by

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Abstract

It is easily seen that if p can be written as the sum of distinct divisors of q , then the fraction $\frac{p}{q}$ can be expanded with no denominator greater than q itself. The idea behind this concept has provided another method for writing the Egyptian fractions (sum of Unit fractions) for any rational $\frac{p}{q}$, $q \neq 0$.

Pages **387 – 390**

60)

Enhancing refraction statics correction from first break interpretation - the Niger Delta example

by

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Abstract

The focus of this paper is on improving the statics corrections obtained from first break interpretation using generalized linear inversion GLI3D by effective incorporation of uphole data. Different near surface velocity models were compared by computing the corresponding statics and evaluating their impact on seismic image. The results show that to maximise first break interpretation using the generalized linear inversion method, the uphole information regarding the actual number of layers and velocities should be incorporated into the GLI3D scheme so as to allow for faster convergence between the model breaks and the field breaks resulting in better statics application.

Pages **391 – 396**

61)

On the equivalence of some iteration schemes for a class of quasi-contractive operators

by

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Abstract

We prove that Picard, Mann, Mann with errors, Ishikawa, Ishikawa with errors, Noor, Noor with errors, multistep and multistep iterations with errors are all equivalent when applied to a class of quasi-contractive operators. Our results are extensions and generalisations of the known results of Soltuz [11, 12].

Keywords: Picard, Mann, Ishikawa, Noor, Multistep, iterations with their respective errors, quasi-contractive operators.

2000 AMS Mathematics Classification: 47H10

Pages 397 – 404

62)

Temperature and velocity profile on thermal ignition in a reactive variable viscosity poiseuille flow.

by

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Abstract

This study evaluates the physio-chemical properties that are associated with thermal ignition in a strong exothermic reaction of variable viscosity combustible material flowing through a channel with isothermal walls under Arrhenius kinetics, neglecting the construction of the material under physical and reasonable conditions to give further insight into the theory of combustion. It shows that these properties has greater influence on thermal ignition. Temperature and velocity profiles were also considered. The procedure reveals accurately the state thermal ignition criticality conditions for as well as their dependent on viscous heating parameter. The numerical method used can be used as an effective tool to investigate several other dependent nonlinear boundary – value problem.

Pages 405 – 410

63)

Development of data encryption and decryption algorithm using 4-row rail fence cipher

by

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Abstract

The increase use of electronic means of data transfer from one point to the other coupled with growth in networking and internet has really called for vital security. This security is usually achieved by encryption and digital signature. Data encryption is the automated process of securing data so that no unauthorized person can access them. It makes use of different algorithm to scramble (encrypt) the original message called plaintext into an unintelligible message called cipher text. Key is an important object in data encryption. There are some data encryption algorithm that uses same key for both its encryption and decryption while some uses two keys, one for encryption and the other for decryption. Rail fence cipher is categorized under data encryption algorithm that uses same key for both its encryption and decryption. The number of rows used to break up text/data to be encrypted into rows and column arrangement serves as the key in Rail fence cipher. In this paper we present the algorithm that can encrypt and decrypt data using a 4-row Rail Fence Cipher.

Keywords: Encryption, Decryption, Cipher text, algorithm, Rail Fence Cipher, Plain text, Row

Pages **411 – 416**

64)

Effect of matrix transformation on minimization of quadratic functional

by

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Abstract

The convergence profile of the conventional Conjugate Gradient Method (CGM) algorithm is based on the symmetry of the control operator for quadratic functions. This work considers the quadratic functions with non-symmetric control operator under suitable

matrix transformations: it is proved that the conventional CGM algorithm produces results that are favourably comparable to problems with symmetric control operator equivalent.

C.R. Category: G. 1.7

Pages 417 - 422

65)

Instantaneous source functions of a 3D source subject to edge water drive mechanism

by

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Abstract

This paper derives necessary instantaneous source functions of some reservoir systems with horizontal wells (3D sources) experiencing edge water drive. Eleven (11) different systems were considered for which thirty six (36) instantaneous source functions were derived.

Pages 423 – 430
