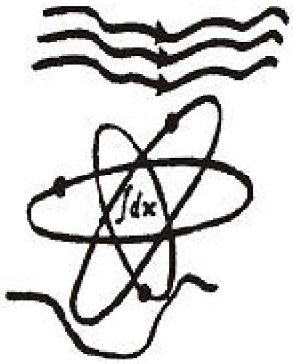
JOURNAL OF THE NIGERIAN ASSOCIATION OF MATHEMATICAL PHYSICS

ABSTRACT OF VOL. 15 NOV, 2009



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1)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 1 - 4**

On the group structure and root system of SL_n over a field

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Abstract

Given a commutative field F, the Whitehead functor K_1 and Steinberge functor K_2 are closely related to the theory of general linear group through exact sequences of groups. In this paper, the group structure of SL_n over a field F is closely examined and its root system is computed. Only the case n = 3 is considered.

Keywords: Special linear group, root system, cartan integer. MSC: 17BXX, 17B20

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2)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 5 - 8**

Number of permutations with a given cycle_structure

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Abstract

Let X_n be an n-element set. We give an alternative proof of Cauchy's theorem for the number of permutations with a given cycle_structure in X_n.

Keywords: Combinations, Permutations, cyclic-permutation, even (odd) permutation, symmetric group, alternating group.

2000 AMS Subject Classification: 20M18, 20M20, 05A10, 05A15.

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3)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 9 - 12**

A note on connected simple graph of order *n ≥ 4*

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Abstract

In this paper, we investigate the existence of a class of connected simple graph, G, with $|V_G| \geq 4$, equipped with a special degree sequence, using Euler's Handshaking lemma [5]. We show that a graph of order, n, with degree sequence $d(v_1) = n - 1$, $d(v_2) = n - 2$, … $d(v_{n-1}) = 1$, $d(v_n) = 1$, , does not exist at the moment $n \geq 4$. *Furthermore we show that it does exist for smaller graphs and why this is so.*

Keywords: Connected graphs; simple graphs; Handshaking lemma; degree sequence

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4)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 13 - 26**

Class of intersection numbers of a homomorphic image in the study of difference sets with order 49

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Abstract

The investigation of (v,k,λ) difference sets involves the computation of intersection numbers of homomorphic images of the underlying group. Up to compliments, there are fifteen difference set parameters with order 49 but only three of these parameter sets, namely, (400, 57, 8), (280, 63, 14) and (220, 73, 24) satisfy v ≡ 0 mod 20. In this paper, we demonstrate how to construct difference set images for these parameter sets in Frobenius group of order 20, Frob(20). We also conclude that if Gis a group of order 220 with factor group H that is isomorphic to Frob(20) then Gdoes not admit (220, 73, 24) difference sets.

Keywords: Difference sets, symmetric designs, affine plane, representations and groups

AMS subject classifications: 05B10 and 05B20

5)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 27 - 36**

Complex analytic dynamics: A modern perspective of iteration in QUOTE $\mathbb{C}\ \mathbb{C}$

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Abstract

In this paper an exhaustive survey of complex analytic dynamics is presented, highlighting in the process significant evolutionary trends the subject has undergone right from the local, down to the global theories. The exponential function QUOTE $E_\lambda(z) = \lambda e^z\ E_\lambda(z) = \lambda e^z$ is then used as a classical example of an entire transcendental function to illustrate new phenomenon of modern perspectives of iteration in QUOTE $\mathbb{C}\ \mathbb{C}$.

Keywords: embeddable, entire transcendental function, Fatou set, Julia set, set of non normality, periodic point, wandering domain, fundamental domain,

6)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 37 - 46**

Effects of static pre-loading on the dynamic stability of a column on nonlinear foundations stressed by a step load

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Abstract

This paper presents, from strictly analytical consideration, the dynamic analysis of a finite column stressed by a step load but in the presence of a previously imposed static load. The results show that (a) the dynamic buckling load for this type of loading is relatively higher than that of a similar column stressed by a step load without pre-static loading. Thus, the step load provides a lower bound for such loads (b) it is possible to relate the dynamic buckling load to its static equivalent and thereby by-passing the labour of repeating the entire process for different imperfection parameters.

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7)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 47 - 54**

Perturbation appraisal of the dynamic buckling of an elastic model structure pressurized by a slowly varying load

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Abstract

In this paper, we examine the dynamic stability of a nonlinear dynamical system, with quadratic nonlinearity, pressurized by a strictly slowly varying time dependent load applied just after the initial time. Regular perturbation method in asymptotic expansions of the variables is used .The dynamic buckling load is determined nontrivially and is related to the static buckling load. Such a procedure by-passes the labour of repeating the entire asymptotic procedure for different imperfection parameters.

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8)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 55 - 70**

Torsional vibration of thin-walled elastic beams with doubly-symmetric cross-sections traversed by concentrated masses

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Abstract

In this paper, the problem of analyzing the torsional vibration of thin-walled elastic beams, with open cross-sections that are doubly symmetric and traversed by moving concentrated masses at constant speeds is addressed. The mathematical model adopted accounts for both the gravitational and inertial effects of the moving loads, thus making the problem a moving-force moving-mass problem. Variable coefficients with strong singularities are therefore present in the characterizing differential equation. By means of Green's function of the associated moving-force problem, the complete moving-force moving–mass problem is transformed into an integro-differential equation. An iteration scheme for solving the integro-differential equation has been proposed and shown to converge to a unique continuous function of space and time, the only solution to the equation.

Keywords: Torsional vibration; thin-walled elastic beams; doubly-symmetric cross-section; Green's function; integro-differential equation

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9)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 71 - 78**

Continuous implicit method for the solution of general second order ordinary differential equations

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Abstract

Methods of collocation and interpolation were

adopted to generate a continuous implicit scheme for the solution of second order ordinary differential equation. Newton polynomial approximation method was used to generate the unknown parameter in the corrector. This enables us to solve both initial and boundary value problems.

Keywords: Collocation, interpolation, continuous, implicit, Newton's polynomial, corrector.

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10)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 79 - 84**

Numerical computation of the optimal control model of higher-order nondispersive wave with the extended conjugate gradient algorithm

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Abstract

The paper implemented the optimal control problem of higher-order nondispersive wave. The Extended Conjugate Gradient Method [1], was used to compute the optimal values of the control and state variables of the model while the analytical expressions of the state and control variables generated the analytical values. The corresponding values of the penalty function were also computed for each pair of the state and control variables.

Keywords: Optimal control, control variable, state variable, direction of descent, state and control gradients.

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11)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 85 - 90**

Computational procedures for implementing the optimal control problem of higher-order nondispersive wave using the extended conjugate gradient algorithm

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Abstract

The Extended Conjugate Gradient Method, ECGM, [1] was used to compute the control and state gradients of the unconstrained optimal control problem for higher-order nondispersive wave. Also computed are the descent directions for both the control and the state variables. These

functions are the most important ingredients for implementing the Extended Conjugate Gradient Algorithm..

Keywords: Optimal control, state variable, control variable, descent direction, state and control gradients.

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12)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 91 - 94**

Application of modified power series method for the solution of system of differential equations

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Abstract

In this paper, we used modified power series method to solve nonlinear systems. Some examples were presented to show the ability of the method.

Keywords: Power Series, Nonlinear System, Ecosystem, Modelling.

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13)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 95 - 100**

Null controllability of nonlinear neutral volterra integrodifferential systems with infinite delay

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Abstract

Sufficient conditions are developed for the null controllability of nonlinear neutral Volterra integrodifferential systems with infinite delay. It is shown that if the uncontrolled system is uniformly asymptotically stable, and if the linear system is controllable, then the nonlinear infinite neutral system is null controllable

Keywords: Controllability, neutral Volterra integrodifferential system, infinite delay, uniform asymptotic stability.

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14)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 101 - 106**

Some basic tests on time series outliers

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Abstract

Outliers are common place in applied time series analysis and various types of structural changes occur frequently and raises the question of efficiency and adequacy in fitting models. The methods under consideration for the tests of time series outliers are the Peirce's criterion, Chauvenet's criterion and Grubbs' test. A set of data was considered and later on tested for outliers. From the findings, the Peirce's criterion identified two outliers in the data set while the Chauvenet's and Grubbs' tests both identified only one outlier. In the Peirce's criterion, the result of two outliers were opposed by the Chauvenet's criterion and Grubb's Test because Peirce's criterion accounts for the case where there is more than one suspect data point at once.

Keywords: Time series analysis; outliers; data point, criterion.

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15)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 107 - 116**

Multivariate semi-logistic distribution and processes

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Abstract

Multivariate semi-logistic distribution is introduced and studied. Some characterizations properties of multivariate semi-logistic distribution are presented. First order autoregressive minification processes and its generalization to k^{th} order autoregressive minification processes with multivariate semi-logistic distribution as marginal distribution are developed and studied.

Keywords: Minification process, Multivariate semi-logistic distribution, Autoregressive processes, Stationarity.

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16)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 117 – 122**

On full order autoregressive model fitting

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Abstract

This is a study of the relative performance of nine automatic autoregressive order determination criteria for full-order modeling using the least squares approach. Of the nine: AIC, FPE, CAT_2, S, FPE4, F, SIC, BIC and CAT_3, we have found the trio, AIC, FPE and CAT_3, to be the most consistent. The rest underestimate relatively.

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17)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 123 – 132**

Flow in a triangular open channel with hydraulic jump

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Abstract

Mathematical model for dredging a triangular open channel with hydraulic jump is developed using the method of successive approximation. Applying the model to a numerical example new parameters of the new (excavated) channel are determined and compared with those of the original channel. Another feature of the work is the application of our model in Bernoulli's equation which leads to the energy dissipated in the jump for both the original and new channel. Based on this, other parameters like jump efficiency, relative energy loss, power loss and height of the jump are also determined in the two channels and compared.

Keywords: Mathematical modeling, hydraulic jump, triangular channel, dredging (excavation)

AMS – Mathematical Subject Classification 2000:76B07.

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18)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 133 – 136**

Viscous dissipation effect on the flow through a horizontal porous channel with temperature dependent viscosity

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Abstract

This work investigates the flow of fluid through a horizontal channel filled with a porous media with a temperature dependent viscosity. The influence of Darcy

number on the velocity and temperature was thoroughly investigated. It is observed that high Darcy number leads to a higher velocity and that velocity is parabolic while reversal flow takes place at low Darcy number, while at very low Darcy number, oscillation and instabilities of flow is observed. It is also observed that as the brinkman number increases the temperature profile increases.

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19)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 137 - 146**

A flow in a trough: An integral equations formulation

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Abstract

The problem of fluid flow in an open trough driven by the base moving horizontally along its plane, was considered in [2, 3]. The approach used was based on finite difference technique which takes a lot of memory. This paper reformulates the problem in terms of integral equations and the resulting equations solved numerically. The integral reformulation is desirable as it uses less computer memory and is expected to give more accurate result as numerical integration is a more stable process than differentiation process.

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20)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 147 - 154**

The role of Coulomb interaction in the structural formation of molten Ytterium chloride

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Abstract

We considered the ionic arrangement within liquid QUOTE $YCl_3 YCl_3$ as an example of the strong ionic melts of lanthanide-metal-trichlorides. Numerical calculations of the correlation functions of the liquid based on an ionic model and a Busing pair potential were carried out. Parameters of the Y^{3+} QUOTE Y^{3+} were fitted to the Y - Cl bond length in a YCl_3 crystal and the breathing mode frequency of the $(YCl_6)^{3-}$ QUOTE $(YCl_6)^{3-}$ octahedral unit. The optimized random phase approximation (ORPA) was adopted for the closure relations. Our results were in good agreement with the available experimental data at short-range order. It was also observed that the theoretical partial structure factor, as well as other pair correlation functions, would always provide insight into the origin and nature of the short-range and intermediate-range orders within this class of material.

Keywords: Coulomb interactions, correlations and liquid lanthanide-metal-trichlorides

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21)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 155 - 162**

First-principle calculation of SP^3 hybridization and bonding in diamond-structure semiconductor crystals

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Abstract

The electronic charge density due to the sp^3 hybridized orbitals electrons in the diamond-structure semiconductor crystals has been calculated for the k = 0 state. This charge density represents the electronic distribution in the direct lattice of the crystals. Normally, the charge density in a condensed matter such as crystals is obtained from extremely complicated functions. However, in this work, the charge density is calculated from first-principles. The basic inputs are the lattice constant of the crystal and the atomic number of the atom. To obtain the required expression for the hybrids, we must choose some orientation for the tetrahedral bonds with respect to the Cartesian axes. The most convenient orientation chosen is to inscribe the tetrahedron in a cube whose edges are parallel to the Cartesian axes as shown in Figure 3.1. The tetrahedral bonds point towards the corners of a unit cube. The centre of the cube is the origin of the coordinates. The charge density is calculated along the four tetrahedral bonds and the [100], [010], and [001] directions. The density along the bonds directions is found to be the same. Also, the density along the [100], [010], and [001] directions are the same at equal distances from the center of the Wigner-Seitz cell (which is the origin of coordinate axes employed). In general, the density rises from zero at the center of a cell to a certain maximum value and then drops down as the distance is further increased. The results obtained also explain the known hardness of carbon (diamond).

Keywords: Slater Orbitals, Bonding, Electronic Structure.

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22)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 163 - 170**

Computation of the Skyrme–Hartree–Fock equations in the Cartesian deformed harmonic-oscillator basis

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Abstract

We present the modified version of the code HFODD which solves the nuclear Skyrme–Hartree–Fock problem using the Cartesian deformed harmonic-oscillator basis. The modified code gives (i) the general parameters for starting point of the iteration, that provides the convergence report (ii) maximum numbers of the HO quanta in three directions, (iii) the vacuum and particle-hole configurations for the case of the parity symmetry, (iv) the corresponding values of the coupling constants in the Skyrme functionals, (v) the average values of the total and intrinsic neutron, proton, and total angular momentum, it (vi) the corresponding values and contributions to the first moment of inertia and (vii) a summary of the energies calculated for the HF state. Items (ii) and (iv) we not obtainable using the original program.

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23)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 171 - 178**

Evaluation of n + ^{16}Fe reaction cross section at 14*MeV* incident energy

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Abstract

Cross section calculations have been carried out by some earlier scientists independent of energy surface imaginary potential. These have been characterized by a lot of disparity between authors and literature values. In this work, special attention was devoted to the increase in the accuracy of the calculation of nuclear data needed for structural materials. To do this, optical model (OM) scat 2 was applied using the deformed optical para magnetization. The results showed that the total cross section is numerically the sum of the shape elastic and compound nucleus formation cross section. Results obtained are in good agreement with literature values within ± 5%.

Keywords: Cross section, transmission coefficient, compound nucleus, and multiple particles.

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24)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 179 - 188**

Evaluation of the contributions of ^{232}Th and its progenies to the ingestion dose coefficients

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Abstract

In International Commission on Radiological Protection (ICRP) Publication 69, a dosimetric multcompactmental model for ^{232}Th was proposed for possible application and testing its reliability in the estimation of dose to critical cells of the body. The present work employed this dosimetric model as proposed by the

ICRP to estimate the ingestion dose coefficients to organs/tisues of the body using thorium/daughter hybrid method with serial transformation to accumulate nuclear transformation. This method made it possible to estimate the contributions of ^{232}Th and its progenies to the ingestion dose coefficients. The results obtained revealed that the estimated ingestion dose coefficients compared very well with the ICRP values. Moreover, the alpha emitters in the thorium chain contributed more than 95% to the dose coefficients. It is also believed that the present effort has contributed to the validation of the ICRP model for possible application to similar radioelement.

Keywords: Model, thorium, progenies, intake, dose coefficients

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25)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 189 - 196**

Effects of both wellbore and reservoir properties on pressure and pressure derivative distribution of a horizontal well subject to complete external fluid drive

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Abstract

The task of clean oil production from a horizontal well under complete external fluid drive is a huge challenge to the operator who intends to exclude unwanted fluid production. In order to determine guidelines for drilling or modifying a horizontal well to achieve economic production therefore, dimensionless pressures and their derivative for such a well were studied theoretically, to investigate the effects of all wellbore and reservoir properties on overall well performance, assuming unsteady flow. For all sets of parameters considered, the dimensionless time of attainment of steady state, t_{Dss}, was calculated. This is the minimum dimensionless time beyond which clean oil production can no longer be guaranteed for a particular well completion. Results

obtained show that the dimensionless time of arrival of external fluid at the wellbore increases with shorter dimensionless well lengths, unaffected by dimensionless well radius, and decreases with shorter reservoir size. Furthermore, well completion and re-completion practices can delay external fluids breakthrough. However, well eccentricity and perforation locations do not affect arrival times as well as well productivities. Finally, results also show that well productivities are affected inversely by dimensionless wellbore radius and directly by reservoir thickness and reservoir geometry.

Nomenclature

p = pressure, psi;

k = permeability, *md;*

h = pay thickness, *ft*;

t = time, hours;

q = flow rate, STB/Day;

m = oil viscosity, cp;

B = oil formation volume factor, bbl/STB;

c_t = total fluid compressibility, 1/psi; L = well length, *ft*;

erf = error function; t = dimensionless dummy time.

Subscripts

x, y, z = *x, y*, or *z*, directions; *D* = dimensionless; *w* = wellbore; e = external

$$Ei(-x) = \int_x^{\infty} \frac{e^{-u}}{u} du \quad ,$$

$$p_D = \frac{kh\Delta p}{141.2q\mu B} \quad ;$$

$$t_D = \frac{0.001056kt}{\mu\phi c_t L^2} \quad ;$$

$$i_D = \frac{2i}{L}\sqrt{\frac{k}{k_i}}$$ *i* = positions along *x* or *y* or *z* axes, *ft*;

$h_D = 1/L_D$;

D = drop;

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26)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 197 - 204**

The use of source and Green's functions to model pressure distribution in a bounded layered reservoir with lateral wells, Part II: General solutions

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Abstract

In this paper, solutions to the mathematical models in Part I of this title are derived. Appropriate flow period delineation methods are discussed. Results show that as an enlarged reservoir, flow attains pseudosteady state at late times when reservoir dimensionless pressure is inversely proportional to the reservoir dimensionless external lengths and directly proportional to dimensionless flow time. Furthermore, only superposition in time can be used to account for complete dimensionless pressure history. Finally, flow periods delineation makes it possible for individual layer dimensionless pressures to be quantified and therefore permits individual layer characterization.

Nomenclature

h = pay thickness, ft;

t = time, hours;

q = flow rate, STB/Day;

m = oil viscosity, cp;

B = oil formation volume factor, bbl/STB;

c_t = total fluid compressibility, 1/psi;

L = well length, ft;

erf = error function;

t = dimensionless dummy time variable.

Subscripts

x, y, z = *x, y*, or *z*, directions;

D = dimensionless;

w = wellbore;

e = external

A = external dimension along *x*-axis, *ft*;

b = external dimension along *y*-axis, *ft*;

$p_D = \frac{kh\Delta p}{141.2q\mu B}$;

$t_D = \frac{0.001056kt}{\mu\phi c_t L^2}$;

$i_D = \frac{2i}{L}\sqrt{\frac{k}{k_i}}$ i = positions along *x* or *y* or *z* axes, *ft*;

$h_D = 1/L_D$; D = drop;

p = pressure, psi;

k = permeability, *md*;

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27)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 205 - 212**

Groundwater and contaminant flow modelling in Olomoro area of Delta State

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Abstract

Geophysical investigation and hydrogeological information have been used with a steady state groundwater flow simulation model to describe the aquifer system and the flow rate of contaminants in the Olomoro area of Delta State. The area was modelled with a grid of 100 row × 65 columns. A conceptual model was developed from the results of the Electrical resistivity survey. The aquifer zones delineated from the Electrical resistivity sounding and the well inventory of the area formed the basis for the flow modelling. The model was simplified into three layers; the top soil, the clayey sand/laterite/clay layer and the sand layer. The first two layers of thickness 2-10m are assigned low hydraulic conductivity values while the third layer of thickness 10 - 100m is assigned high hydraulic conductivity value. The aquifer system is modelled as a single layer. The Groundwater Vistas software, version 4, from the Environmental Simulation International (ESI) containing the U.S. Geological Survey three dimensional finite difference code MODFLOW and MODPATH packages was used to simulate the conceptual understanding of the geology and hydrogeology of the area. The modelling results gave average groundwater flow velocity of the area to be about 388 m/year. This finding may provide baseline information during environmental impact assessment of the area.

Keywords: Model, thorium, progenies, intake, dose coefficients

28)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 213 - 222**

The use of material balanced equation to determine the oil water contact of an oil reservoir

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[2]***Shell Petroleum Development Company Warri, Nigeria.***

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Abstract

The oil water contact of an oil reservoir can be determined using some geophysical well logs. However, some of the methods might not be accurate. Therefore the material balanced equation which is an accurate means of formation evaluation is critically analysed in this study and then used to determine the oil water contact of oil reservoirs A and B in the Niger Delta Basin of Nigeria.

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29)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 223 - 236**

Estimation of transport and degradation parameters for naphthalene and anthracene: Influence of mass transfer on kinetics

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Abstract

The method of temporal moment solutions (MOM) for one-dimensional convective-dispersive solute transport involving linear equilibrium sorption and first order degradation for time pulse sources has been applied to analyze experimental data from a soil microcosm reactor. Estimation of the pore-water velocity V for a non-reactive solute was aided by the use of only the first normalized moment while the dispersion coefficient D, first-order degradation rate constant l and the retardation factor R were estimated using both first and second normalized moments. These transport and degradation parameters were compared to those obtained by a transport model using a nonlinear least square curve-fitting program CXTFIT (version 2.0). Results obtained showed that the MOM fits the breakthrough curve with tailing better than the CXTFIT. The initial estimates of these parameters aided the reduction of the dimensionality of the search process of the non-steady state model. A residual concentration of naphthalene 1.12E-5mg/l, 1.48mg/l, and anthracene 7.67E-4mg/l, 1.61mg/l in the axial and radial directions respectively suggests the preference of naphthalene during the biodegradation process. The surface concentration as depicted using three-dimensional plots, showed that there is occlusion of the aromatics (naphthalene and anthracene) within the soil micropores thereby limiting their bioavailability and in the long run increasing their toxicity.

Keywords: Normalized moments, surface concentration, breakthrough curves, biodegradation, and bioavailability

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30)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 237 - 246**

The structure of white dwarf stars

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Abstract

A FORTRAN code to compute the structure of white dwarf Stars has been written. It is assumed that a good model for the matter in white dwarf stars is the free Fermi gas of electrons at zero temperature, treated with relativistic kinematics. The code written essentially solves numerically the two coupled first-order differential equations that determined the structure of the star for the given equation of state. The variation of mass density with distance from the center of the star is found to be directly proportional to the assigned density at the center of the dwarf and the value of the parameter η which characterizes the chemical composition of the dwarf, but inversely proportional to the distance from the center of the star. In general, the density decreases with increase in the distance. For a given central density, the radius of the hydrogen white dwarf is greater than that of the helium, carbon, or oxygen which are equal and greater than that of iron. Thus the radius increases with the parameter η. The so called Chandrasekhar mass limit has been found to be 1.144×10^{34} gm for hydrogen white dwarf, 2.861×10^{33} gm for helium, carbon, and oxygen white dwarf, and 2.464×10^{33} gm for iron white dwarf.

***Keywords*:** White Dwarf, Equation of State for Degenerate Matter

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31)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 247 - 252**

Gravitational time dilation and length contraction in fields exterior to static oblate spheroidal mass distributions

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Abstract

Here, we use our new metric tensor exterior to a massiv3e oblate spheroid to study the gravitational phenomena of time dilation and length contraction. It turns out most profoundly that, the above phenomena hold good in the gravitational field exterior to an oblate spheroid. We then use the oblate spheroidal Earth to exemplify our findings in approximate gravitational fields.

Keywords: Gravitation, world line element, time dilation, length contraction

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32)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 253 - 264**

On a dynamic costs optimality for a production company

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Abstract

The allocation of human and physical resources over time is a fundamental problem that is central to science, management science and engineering. In this paper, we consider the dynamics of allocation of resources at a minimum cost in a production company in Nigeria. The company is assumed to be made up of different departments. Our aim is to consider problem arising from freight department. We consider a process where by n-dimensional vector functions F with error sequence $\| \Gamma^k F - F^* \| \leq \beta^k N$, for all $N \in \Re, 0 \leq \beta < 1$ is use to determined the minimum costs of distributing products from production centres to the markets. We found that the minimum costs of the operations converges to minimum costs when error bounds are included. In other word, minimum costs of the operation with error bounds and without error bounds assumed the same vector values only at infinite stage. We also found out that the first production centre has the minimum costs.

Keywords: Value Iteration; Error Bounds; Dynamic Costs Optimality; Transition Cost; Transition matrices.

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33)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 265 - 276**

The dynamics of stock price and determination of investor's cash flows valuation.

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Abstract

We consider the dynamics of share price, that is, upward and downward movement of share price at time t. We made use of binomial derivative pricing process of

stochastic processes. Our aim is to also determine investor's cash flows valuation generated from the investment. The investor invested her short position into N number of investment firms. The firms in turn invest the short position of the investor into the stock and bond markets in order to hedge out the risks associated with the investor's portfolio. We determine the value of the cash flows at time, t = 0 by finding the value of the discounted cash flows using a suitable discount rate. We assume that the discount rate is deterministic. We found out that with different values of the investment at the initial time from the investment firms over time yield almost the same percentage change (not the same value at time t) with the same interest rate. In this paper, we assume that there is no transaction costs.

Keywords: Investor; Cash flows valuation; Share price; Portfolio; Discount rate.

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34)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 277- 280**

Pack nitriding of aluminium using cassava waste

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Abstract

Pack Nitriding is a process analogous to pack carbonizing. In this work, cassava leaves were employed as a source of nitrogen. Upon heating, slow decomposition of the compound provides Nitrogen, the Nitrogen was allowed to interact with aluminium metal surfaces, which were packed nitrided at temperature of 350^0c. The time duration varied from 1 hour to 6 hours. It was observed that there was an

increase in strength and hardness of aluminium. Therefore, a nitriding of aluminium using cassava leaf as a source of nitrogen is assessed possible.

Keywords: Diffusion, surface, nitriding, aluminium, cassava, strength.

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35)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 281 - 286**

On congruence lattices

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Abstract

Investigations of the lattice of congruences on a semigroup have taken two different directions. One approach is to study special congruences on a semigroup, and describe their relative positions within the lattice of congruences. For some classes C_1 and C_{-2}, it will happen that the intersection s is, of course, the minimum C_1 congruence on S, and S/s is a maximal homomorphic image of S of type C_1. For instance, it is easily seen that the intersection of all commutative congruences on any semigroup is a commutative congruence, and so every semigroup has a minimum commutative congruence. Similarly, every semigroup has a minimum band congruence (denoted b) and a minimum semilattice congruence (denoted h). We outline some results dealing with the lattice of congruences of a semigroup. It is clear that a modular lattices is a semimodular, but the converse, however, is not true.

Keywords: Complete lattice, modularity, homomorphic, isomomorhic . AMS Subject classifications:

20M10 and 08A30

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36)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 287 - 290**

Finitely generated commutative Noetherian semigroups

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Abstract

We provide a short and more direct proof that a commutative semigroup is finitely generated if its lattice of congruences is Noetherian.

Keywords: Commutative, noetherian, monoid, congruence, partial order, idempotent, artinian. AMS Subject classifications: 13D02 and 13A50.

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37)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 291 - 296**

Three classes of Ermakov systems and nonlocal symmetries

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Abstract

Ermakov systems have attracted enormous treatments in recent times particularly in symmetry analysis. In this paper we consider three classes of the Ermakov systems by using a simple algebraic reduction process with imposed conditions on the magnitude of the angular momentum of each system class to obtain new generalized symmetries. We note that this imposed condition transforms the Kepler-Ermakov systems to the generalized Ermakov systems.

Keywords: Reduction process, Dynamical systems, Ermakov systems, Nonlocal, generalized, symmetries.

AMS Subject classifications: 34C14, 37C80, 37J15, 70S10 and 76M60

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38)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 297 - 304**

Effective valence as the control parameter of the superconducting iron pnictide T_c

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Abstract

One approach to investigating the superconductivity in the iron-based materials is understanding the chemical and structural parameters that can be used to tune their remarkably high T_c. In this paper, we have demonstrated that

the effective valence of iron can be used as the control parameter to tune the T_c of this family of superconducting materials. This is achieved by postulating that our model of spin fluctuation which has been used to successfully account for the superconductivity in the cuprates in Ref. [21] can also be applied to the superconducting iron-based materials.

39)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 305 - 310**

Numerical calculation of the ground state of Helium atom using Hyllerass algorithm

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Abstract

Hylleraas did the calculation of the ground state in 1926 using the variational parameter a. In this paper we trace Hylleraas historic calculation, the use of computer enables us to improve the approximation found by Hylleraas . The program was written in FORTRAN language, designed in such away that for a particular value of dimension D, we varied the variational parameter a and the corresponding minimum energy was computed. The optimal value of the dimension D, that is D =20, and for all possible values of the basis state, the variational parameter a=1.05 has the lowest energy of –79.015104eV; compared with the historic calculation of Hylleraas the difference is only 0.0329eV. (0.02%)

40)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 311 - 316**

The transmission properties of the motion of the oval and round windows

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Abstract

A mathematical model describing the motion of the oval and round windows is studied. The exact solutions of the equations of motion are obtained. For certain model configurations, the displacement patterns of the motions consist of sinusoidal waveforms that are in cycles were obtained. The qualitative effect of a transmitted pressure along the tympanic canal is discussed.

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41)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 317 – 328**

An investigation of groundwater by geoelectrical resistivity method: A case study in Ugbogui, Ovia South West Local Government Area, Edo State.

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Abstract

A resistivity survey was carried out in order to study groundwater conditions (such as the depth of aquifer) in Ugbogui, Ovia South West Local Government Area of Edo State. Five (5) vertical electrical soundings by schlumberger array were carried out at different locations. The Schlumberger resistivity soundings were carried out with half- spacing in the range of 1- 422m.The resistivity data were used to determine the depth and nature of the aquifer, and they confirmed that the aquifer in Ugbogui is mainly sedimentary.

Keywords: Electrical soundings, Resistivity data, Aquifer, Groundwater.

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42)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 329 - 336**

Velocity profile and subsurface stratification in oil and gas exploration in parts of Niger Delta Nigeria

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Abstract

In prospecting for crude oil and gas (hydrocarbon), the most useful and most reliable applicable seismic approach is the reflection method because of its high resolution and deep penetration when seismic shots are taken. However, land surveys require the use of pattern holes for logistic reasons as against deep shooting in swamps and seas. With the use of pattern hole shots, there is the need for further investigation of the stratification of the subsurface structure in a particular field as near surface coherent and random noise tend to

obscure useful signals on records. One reliable means of subsurface investigation is by running a velocity profile. Velocity profiles of part of Delta South senatorial district were carried out in swats using seismograph Oyo Mc Seis-160mx from which the subsurface structure of the fields were stratified to enhance interpretation of true hydrocarbon traps. The results show that the consolidated region is mainly compact clay, sand stone, shale argillite and weathered fractured rocks which is indicative of possible hydrocarbon reservoir at far depth. However, in computing for the real hydrocarbon depth, an obscuring depth of up to 20 metres need to considered.

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43)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 337 - 344**

The effect of ZnS thin film's electrical conductivity on electromagnetic wave propagated through it

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Abstract

The effect of electrical conductivity on an electromagnetic wave propagating through ZnS thin film is analyzed using electromagnetic wave equation with relevant boundary condition. The solution of this equation enabled us to obtain a parameter known as the skin depth that relates to the conductivity of the thin film. This was found to give rise to exponential damping for all wavelengths between the optical, UV and Near-infrared region during the propagation. The penetration of the field into the thin film medium was seen to decrease in the analysis. The effect of skin depth on the reflection and transmission coefficient of the propagated waves through the thin film was also analyzed.

Keywords: Conductivity, skin-depth, electromagnetic-wave, propagation,

penetration depth, thin film, impedance, reflectance, transmittance

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44)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 345 - 348**

The study of the optical properties of copper based chalcopyrite semiconductors

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Abstract

The dielectric constants and reflectance of $Cu_2In_4Se_7$, $CuGa_3Se_5$ and $CuGa_5Se_8$ typical chalcopyrite belonging to the family of ordered defect compounds (ODC) were computed using $\varepsilon(\omega)=\varepsilon_1(\omega)+i\varepsilon_2(\omega)$ ***and*** $R=\frac{(n-1)^2}{(n+1)^2}$ obtained from the values of the experimental results of the refractive index n and the extinction coefficient κ**. The graphs plotted from the computed values of the dielectric function and the reflectance were analyzed and compared with experimentally measured values at the angles of 55^0 and 65 ^{0} and they were found to be in tandem.**

Keywords: Dielectric function, Extinction coefficient, Reflectance, Refractive index, Optical properties, Chalcopyrite

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45)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 349 - 354**

Optical characteristics of crystalline antimony sulphide (Sb_2S_3) thin film

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Abstract

This paper presents the important optical characteristics of crystalline Sb_2S_3 film deposited on glass substrate using solution growth technique at 300k. These characteristics were analyzed using PYEUNICAM SP8-100 spectrophotometer in the range of UV-VIS-NIR while the morphology and the structural composition were analyzed using (metallurgical Microscope OLYMPUS BH-2 and Camera) and XRD respectively. The band gap was obtained from the plotted graph of absorption co-efficient against the photon energy. The optical characteristics of the film were manifested on the graphs of the absorbance and transmittance against wave- length.

Keywords: Optical characteristics, absorbance, transmittance, absorption-coefficient, thing film, reflectance.

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46)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 355 - 362**

Embedded confusion matrix in Fuzzy logic for system appraisal

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Abstract

Fuzzy logic methods give effective system appraisal solution to some classification problems as against some techniques on probability prediction of solution. This paper used fuzzy logic approach as a comparative method to visual encoding technique.

Keywords: Cleaning data, data mining, filter data, visual encoding or confusion matrix.

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47)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 363 - 370**

Application of Neuro-Fuzzy to palm oil production process.

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Abstract

Palm oil is an important nutritional food requirement and in order to facilitate the production of palm oil for consumption, the production process of palm oil has been investigated. The basic operations involved in the production of edible palm oil include; purchase, transportation and reception of oil palm bunches; bunch threshing and fruit fermentation; sorting and weighing of oil palm fruits; boiling, digestion and pressing of palm oil fruits; clarification and drying of palm oil and palm oil storage. A Neuro–Fuzzy model was used to analyze the performance of palm oil production process as it affects the basic operations involved in the production of edible palm oil. The research work can be applied to any other small or medium scale production firm for better efficiency.

Keywords: Edible Palm Oil, Production Process, Bunch Reception, Fruits Digestion, Production Stages, Neuro–Fuzzy

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48)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 371 - 378**

A rational second order difference equation with convergence solutions

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Abstract

.A review of second order difference equation is presented with instructive analysis of second-order rational difference equations. After classifying the various types of these equations and introducing some preliminary results, we systematically investigate each equation for convergence of solutions to the equilibrium. The convergence rate of solutions of a second order rational difference equation has been treated. We also investigate the rate of convergence of solutions of some special cases of the equation $x_{n+1}= (\alpha+\beta x_n+\gamma x_{n-1})/(A+Bx_n+Cx_{n-1})$, n = 0,1,…, with positive parameters and nonnegative initial conditions which gives precise results about the rate of convergence of the solutions that converge to the equilibrium.

Keywords: Rational, Second Order, Difference Equation, Convergence of Solution.

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49)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 379 - 390**

A bagging approach to network intrusion detection

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Abstract

Accompanying the benefits of Internet are various techniques of compromising the integrity and availability of the system connected to it due to flaws in its protocols and software widely entrenched. The presences of these flaws make a secured system a mirage for now, hence the need for intrusion detection system. In this paper, an ensemble approach – Bagging was used on five different machine learning techniques to improve accuracy of classifiers. Machine learning seeks for methods of extracting hidden pattern from data and come up with its own rules based on given data set. The five techniques were made up of two unsupervised (clustering) techniques – Kmeans and Fuzzy Rough C-means, and three supervised (classification) techniques – TreeReduct, LEM2 and Bayesian. Experimental study was carried out on the International Knowledge Discovery and Data Mining Tools Competition (KDD) dataset for benchmarking intrusion detection systems. The results generated from the experiment revealed that ensemble approach performance on the attack types and normal is slightly better or equal to the best performed algorithm on that particular class.

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50)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 391 - 398**

Oscillatory behaviour of solutions of linear neutral differential equations with several time lags driven by space-time noise

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Abstract

The paper considers the contribution of space-time noise to the oscillatory behaviour of solutions of a linear neutral stochastic delay differential equation. It was established that under certain conditions on the time lags and their speed of adjustments, the presence of noise generates oscillation in the solution of the equation irrespective of the magnitude of the time lags. This is contrary to the comparable classical neutral differential equation which can permit a non-oscillatory solution.

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51)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 399 - 404**

Control derivative to optimal control analysis

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Abstract

Optimal control theory, generally, is to determine the control signals which will cause a process to satisfy the physical constraints and at the same time optimize some performance criterion. In this work, a numerical method for finding solution to linear optimal control problems with bounded state constraints is examined. The method applied is based on Legendre series by parameterization of both the state and the control variables involving a derivative.

52)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 405 - 414**

Marshall-Olkin multivariate semi-logistic distribution and minification processes

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Abstract

Marshall-Olkin Multivariate semi-logistic distribution (MO-MSL) and Marshall-Olkin multivariate logistic distribution (MO-ML) are introduced and studied. Various characterizations properties of Marshall-Olkin multivariate semi-logistic distribution are investigated and studied. First order autoregressive minification processes model and its extension to k^{th} order autoregressive minification processes model both with Marshall-Olkin multivariate semi-logistic distribution as marginal distribution are constructed and studied.

Keywords

Autoregressive minification processes of order 1 and *k*; Chacterizations;

Marshall-Olkin multivariate logistic distribution; Marshall-Olkin multivariate

Semi-Logistic distribution; Stationarity; Survival function.

53)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 415 - 424**

Batch arrival discrete time queue with gated vacation system

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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 understudy here is the Gated systems: In a gated system, as soon as the server returns from vacation it places a gate behind the last waiting customer. It then begins to serve only the customers who are within the gate, based on some rules of how many or how long it could serve. 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 [2] 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, Gated Vacation system.

***Volume* 15 (November, 2009), pp 425 - 430**

Simulated queues in dynamic situations

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Abstract

Discrete event simulation of dynamic situation of queuing systems has been carried out using the next-event simulated time procedure for the Monte Carlo and Area approaches. Simulation of the queuing system will be from the arrival and departure of customers from a local commercial bank. Using simulation of events, certain number k of cashiers attend to customers in queues. We designed a situation whereby in a month, we have three periods: most busy days from 25^{th} to 5^{th}, more busy days from 6^{th} to 12^{th} and busy days from 13^{th} to 24^{th} of the month. The dynamic nature of the periods will change the status of a number of random variables like the length of each queue, the time delay of each customer and the cashiers involved. The computational problem of this approach has been accommodated by making the dimensionality of the problem both in terms of the number of choices and sizes of the state space small.

Keywords: Monte Carlo approach, Dynamic situation, Queuing System, service times, simulation run

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55)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 431 - 436**

Modelling atmospheric temperature rise due to pollutants and its implications on agriculture

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Abstract

Using a mathematical model we show that temperature increases (warming) as the Hartman number due to pollutant increases. Thus, temperature and pollutants contribute to global warming. We also discuss the implications of the result on agriculture and forestry.

Keywords: Global warming, pollutants, mathematical model, agriculture and forestry

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56)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 437 - 442**

On the Arrhenius reacting flow over a stretching sheet in the presence of magnetic field

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Abstract

We present an analysis of the boundary layer flow of a reacting fluid. We show that the problem has a solution. We present an analytical

solution for the limiting case of the Frank-Kamenetskii parameter ε. Numerical Results feature preliminary when e = O(1) .

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57)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 443 - 446**

A note on the effect of affinity hemodialysis on *T*-cell depletion

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Abstract

We modify existing mathematical models for HIV that account for observation from hemodialysis. Of particular interest are the criteria under which the disease infected equilibrium could be stable we indicate treatment that is adequate to significantly lower gp 120 levels and help T cells to recover to normal level.

Keywords: Affinity dialysis, HIV/AIDS, Envelope proteins gp 120, criteria for stability.

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58)

Journal of the Nigerian Association of Mathematical Physics

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Influence of power-law exponent on an unsteady endothermic reaction

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Abstract

In [6], the solution of a steady Arrhenious endothermic chemical reaction where the exponential term was reduced to a power-law approximation was studied. A numerical solution obtained using a shooting technique with second order Runge-Kutta scheme showed that the minimum temperature of the reactant increases as the power-law index increases. In this paper, the scope of the work was extended to a solution of an unsteady Arrhenious endothermic reaction using shooting technique [3]. The result showed that the temperature of the reactant depends greatly on the power-law exponent. The temperature of the reactant increases as the power-law exponent α increase, whereas the temperature decreases as the Frank-Kamenestkii parameter β increases.

Keywords: Power-law exponent, endothermic reactions, shooting technique, Frank-Kamenestkii parameter.

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59)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 453 - 460**

Effect of slip velocity on oscillatory MHD flow of stretched surface with radiative heat transfer and variable suction

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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 with radiative heat transfer and variable suction has been made. Analytical solution of an oscillatory boundary layer flow bounded by two horizontal flat plates, one of which is oscillating in its own plane and the other at rest, is developed by asymptotic expansion in order of epsilon for velocity, temperature and magnetic fields. The fluid and the plates are in a state of solid body rotation with constant angular velocity about the z-axis normal to the plates. The structure of the boundary layers is also discussed. Several known results of interest are found to follow as particular cases of the solution of the problem considered. A parametric study of all parameters involved was considered, and a representative set of results showing the effect of controlling parameters are illustrated.

Keywords: Second grade fluid; Parallel plates; Resonance; Magnetohydrodynamic fluid; Oscillation flow

AMS Subject Classification: 76W05

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60)

Journal of the Nigerian Association of Mathematical Physics

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Second law analysis of slip velocity on oscillatory MHD flow of stretched surface with radiative heat transfer and variable suction

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Abstract

This paper reports the analytical calculation of

entropy generation due to unsteady heat and mass transfer flow of an incompressible, electrically conducting, and viscous fluid past an infinite vertical porous plate along with porous medium of time dependent permeability with radiative heat transfer and variable suction. The fluid and the plates are in a state of solid body rotation with constant angular velocity about the z-axis normal to the plates. Solution of an oscillatory boundary layer flow bounded by two horizontal flat plates, one of which is oscillating in its own plane and the other at rest, is developed by asymptotic expansion in order of epsilon for velocity, temperature and magnetic fields. The influences of the chemical reaction parameter, the thermal and mass Grashof numbers, heat generation/absorption and Hartmann number on total entropy generation were investigated, reported and discussed. A parametric study of all parameters involved was considered, and a representative set of results showing the effects are illustrated.

Keywords: Parallel plates, Radiation, Convective flow, irreversibility, Thermodynamics, Entropy, Viscous fluid, Magnetohydrodynamic fluid, Oscillatory flow

AMS Subject Classification: 76W05

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61)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 469- 476**

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

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Abstract

This paper reports the analytical calculation of the entropy generation due to heat and mass transfer and fluid friction in steady state of a uniformly stretched vertical

permeable surface with heat and mass diffusive walls, by solving analytically the mass, momentum, species concentration and energy balance equation, using asymptotic method. The velocity, temperature and concentration profiles were reported and discussed. The influences of the chemical reaction parameter, the thermal and mass Grashof numbers, heat generation/absorption and Hartmann number on total entropy generation were investigated, reported and discussed.

Keywords: Heat transfer, Mass transfer, Entropy generation, Fluid friction, MHD flow, suction velocity, viscousity

AMS Subject Classification: 76W05

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62)

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***Volume* 15 (November, 2009), pp 477 - 484**

Unsteady MHD free convection flow and heat transfer along an infinite vertical porous plate under Arrhenius kinetics

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Abstract

Steady free convection flow of an electrically conducting fluid along an infinite vertical porous plate under Arrhenius kinetics are investigated in the presence of strong transverse magnetic field imposed perpendicularly to the plate .A similarity parameter length scale (h) as a function of time and the suction velocity are considered to be inversely proportional to this parameter. The coupled non-linear ordinary differential equations obtained are solved numerically using symbolic algebra package (MAPLE) .The effects of various parameters on the velocity and temperature distributions are presented in graphs. The results show that (i)the velocity and the temperature of the fluid decrease with the increase in prandtl number (ii) fluid velocity decreases due to increase in the Hartmann number (iii) fluid velocity increases due to increase in Grashof number which agrees with natural phenomena because of the buoyancy force which assist the flow.

Keywords: Unsteady MHD, free convection, porous plate, Arrhenius kinetics, similarity solution.

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63)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 485 - 490**

MHD flow and heat transfer of a viscous reacting fluid over a stretching sheet.

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Abstract

This paper presents a boundary layer flow analysis for a viscous, incompressible, electrically conducting reacting fluid over a stretching sheet in the presence of a magnetic field. It is shown that the Hartmann, Prandtl and the Eckert numbers have effect on the velocity and temperature fields.

Keywords: Boundary layer, MHD, Heat transfer, Stretching sheet, reacting fluid

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64)

Journal of the Nigerian Association of Mathematical Physics

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MHD free convection flow past an oscillating plate in the presence of heat generation/absorption and chemical reaction

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Abstract

The study of unsteady magnetohydrodynamic heat and mass transfer in MHD flow past an infinite vertical oscillating plate through porous medium, taking account of the presence of free convection and mass transfer. The energy and chemical species equations are solved in closed form by Laplace-transform technique and then perturbation expansion for the momentum equation. The results are obtained for velocity, temperature, concentration, Sherwood number, Nusselt number and skin-friction. The effects of various material parameters are discussed on flow variables and presented by graphs. A parametric study of all parameters involved was considered, and a representative set of results showing the effect of heat radiation, reaction parameter, Grashof numbers, Hartmann number and permeability factor were illustrated.

Keywords: Free convection, Magnetohydrodynamic flows, Porous medium, mass transfer, Oscillating plate, Viscousity, Oscillatory flow, Permeable surface.

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65)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 501 - 512**

Analytical solution of mass transfer effects on unsteady flow past an accelerated vertical porous plate with suction

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Abstract

This paper discussed the analytical solution of unsteady free convection and mass transfer flow past an accelerated infinite vertical porous flat plate with suction, heat generation and chemical species when the plate accelerates in its own plane. The governing equations are solved analytically using perturbation technique. The flow occurrence is described with the help of flow parameters such as porosity parameter (a), Grashof numbers (Grt, Grc), Hartmann's number (M), heat generation/absorption (b) and reaction parameter (g). The effects of various parameters are discussed on flow variables and presented by graphs. A parametric study of all parameters involved was considered, and a representative set of results showing the effects of the control parameters were illustrated.

Keywords: unsteady, free convection, mass transfer, accelerated plate, porosity, suction, perturbation.

Mathematics Subject Classification: 76S05

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66)

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***Volume* 15 (November, 2009), pp 513 - 522**

A numerical study of the hemodynamics of stenosed artery

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Abstract

In this paper, the non-Newtonian flow of blood in large blood vessel is studied by using Eyring–Powell model. We also assumed a variable blood viscosity. The momentum equation for the flow is non-dimensionalized and the resulting non-linear dimensionless equation is then solved numerically under various flow conditions. Variations of different flow parameters are conducted and discussed.

Keywords: viscoelastic, hemodynamics, stenosis, non-Newtonian flow.

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67)

Journal of the Nigerian Association of Mathematical Physics

***Volume* 15 (November, 2009), pp 523 - 532**

Effect of couple stresses on hydromagnetic flow of blood through a stenosed coronary artery

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Abstract

The function of the coronary network is to supply blood to the heart; however, in cases of Coronary Artery Disease, the geometry has great influence on the nature of

the blood flow and the overall performance of the heart. In this paper, the unsteady non-Newtonian flow of blood under couple stresses and a uniform external magnetic field is analysed by using Eyring –Powell model. We also assumed that blood viscosity is not constant but a function of cell aggregation. The momentum equation for the flow is non-dimensionalized and the non-linear dimensionless equation is then solved numerically by using Adomian decomposition method (ADM) for fixed value of suction parameter. Variations of different flow parameters are conducted and discussed.

Keywords: ADM, unsteady flow, viscoelastic, hemodynamics, stenosed Artery.

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68)

Journal of the Nigerian Association of Mathematical Physics

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Properties of steady solutions of a reacting non-Newtonian viscous MHD poiseuille flow

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Abstract

We revisit an Eyring-powell reacting fluid whose viscosity depends on temperature and the vertical distance, we further assume that the MHD flow satisfies the poiseuille boundary conditions. We show that the velocity field has two solutions corresponding to each solution of the temperature. In particular we show that the upper solution coincides with the lower solution of the velocity and vice-versa. Moreover

the two solutions never cross each other in the interior layer.