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On Some New Extensions and Generalizations of Eneström-Keakeya Theorem

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Abstract

In this paper we obtain some new extensions and generalizations of the well-known classical theorem of Eneström and Keakeya.

Keywords and Phrases: Complex number, Polynomial, Zeros, Eneström-Keakeya theorem, Bounds, Modulus, Disk.

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New Implicit General Linear Method

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Abstract

This paper is concerned with the construction and Numerical Analysis of Extended Exponential General Linear Methods. These methods, in contrast to other methods in literatures, consider methods with the step greater than the stage order ($S > Q$). Numerical experiments in this study, indicate that Extended Exponential General Linear Methods perform better than existing Methods.

Keywords: General Linear Methods, Exponential methods. Order conditions

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A New Iteration Multivariate Pade' Approximation Technique for Nonlinear Partial Differential Equations of Fractional Order

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Abstract

In this paper, the Laplace transform, the New iteration method and the Multivariate Pade' approximation technique are employed to solve nonlinear fractional partial differential equations whose fractional derivatives are described in the sense of Caputo. The Laplace transform is used to "fully" determine the initial iteration value. The New iteration method gives a sequence of series solution which approximates the exact solution of the nonlinear equations. The Multivariate Pade' approximation is used to accelerate the rate of convergence of solutions obtained by the New iteration method. Numerical illustrations were given to show the robustness, simplicity and efficacy of the approach. Also results obtained by the Multivariate Pade' approximation were compared with the results obtained by the Adomian decomposition method.

Keywords: New iteration methods, Laplace transform, Multivariate Pade' approximations, nonlinear fractional partial differential equations, Exact solutions

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A Line-Tau Collocation Method for Partial Differential Equations

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Abstract

This paper deals with the numerical solution of second order linear partial differential equations with the use of the method of lines coupled with the tau collocation method. The method of lines is used to convert the partial differential equation (PDE) to a sequence of ordinary differential equations (ODEs) which is then solved by the tau collocation method to obtain an approximate continuous solution in the spatial variable x at a fixed t -level. The choice of the tau collocation method over the tau method itself was due to the presence of some transcendental functions since both methods produce approximate results. Numerical evidences show that the method performs favourably well.

Keywords: Collocation method, Partial differential equations, Tau method, Method of Lines

Volume 30, (May, 2015), pp49 – 64

On Subgroups of Non-Commutative General Rhotrix Group

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Abstract

This paper considers the pair $(GR_n(F), \circ)$ consisting of the set of all invertible rhotrices of size n over an arbitrary field F ; and together with the binary operation of row-column based method for rhotrix multiplication; $' \circ '$, in order to introduce it as the concept of “non-commutative general rhotrix group”. We identify a number of subgroups of $(GR_n(F), \circ)$ and then advance to show that its particular subgroup is embedded in a particular subgroup of the well-known general linear group $(GL_n(F), \cdot)$. Furthermore, we shall investigate isomorphic relationship between some subgroups of $(GR_n(F), \circ)$.

Keywords: Rhotrix, matrix, group, rhotrix groups, matrix groups, general rhotrix group, general linear group.

Volume 30, (May, 2015), pp 65 – 78

On Non-Commutative Rhotrix Groups over Finite Fields

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Abstract

This paper considers the pair $(FGR_n(Z_p), \circ)$ consisting of the set of all invertible rhotrices of size n over a finite field of integers moduloprime p and together with the binary operation of row-column based method for rhotrix multiplication; ' \circ ', in order to introduce concrete constructions of non-commutative rhotrix groups over finite fields. Furthermore, we pick specific groups $(FGR_3(Z_2), \circ)$, $(FGR_3(Z_3), \circ)$ and analyze them, so as to obtain their elements, multiplication tables, orders and subgroups. In the process, a number of theorems were developed.

Keywords: Groups, subgroups, finite rhotrix groups.

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Rigid Motions of Some Regular Polygons

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Abstract

We examined permutations of vertices/sides of some regular shapes viewed as rigid motions. In particular, we use combinatorial techniques to enumerate symmetric permutations of vertices/ sides of an n -sided regular polygon P_n . Our results involve:

(1) A well known formula, $NSYP_n = 2n$ for generating the number of symmetries in an n -sided regular polygon accomplished using permutations;

(2). A new formula, $NWT_n = \frac{n(n-3)}{2}$ for number of ways of triangulating P_n , (the number of ways of cutting P_n into triangles by connecting its vertices with straight lines); thereby providing a proof for Richard and Stanley's conjecture that "All diagonals are flipped in a geodesics between two antipodes in exactly $\frac{n(n-3)}{2}$ ". We also examined the set $S = [n] = \{1, 2, \dots, n\}$ of vertices of P_n as poset and proved some known theorems.

A discussion is given of lattices whose maximum length chains correspond to restricted permutations.

Keywords: Triangulation, equidissection, area discrepancy polygons, pattern-avoiding permutation, restricted permutation and Symmetric permutation.

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Unsteady Viscous Flow Past an Impulsively Started Porous Vertical Surface with Variable Viscosity Fluid in the Presence of Viscous Dissipation: BSRM Approach

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Abstract

This paper presents a new numerical approach for solving unsteady two-dimensional boundary layer flow past an infinite vertical porous surface with the flow generated by Newtonian heating and impulsive motion in the presence of viscous dissipation and temperature dependent viscosity. The viscosity of the fluid under investigation is assumed to vary linearly with temperature. The flow model is described in terms of a highly coupled and nonlinear system of partial differential equations. The proposed method of solution seeks to decouple the original system of PDEs to form a sequence of equations that can be solved in a computationally efficient manner. A novel approach that applies spectral collocation independently in all underlying independent variables is executed to obtain approximate solutions of the problem. A parametric study of selected parameters is conducted and results for the velocity and

temperature are illustrated graphically and physical aspects of the problem are discussed and compared.

Keywords: Free convection, BSRM, Variable viscosity, viscous dissipation, Newtonian heating.
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Influence of Variable Fluid Properties and Radiative Heat loss on Magnetohydrodynamic Forced Convection Flow in a Fluid Saturated Porous Medium

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Abstract

The present study addresses the problem of MDH forced convection flow in a fluid saturated porous medium with non-Darcy model, which is an important physical phenomenon in engineering applications. The study extends the previous models to account for effects of variable fluid properties in the presence of radiative heat loss. The dynamic viscosity and thermal conductivity are assumed to vary linearly respectively, with temperature whereas the contribution of thermal radiative heat loss is based on Rosseland approximation. The problem is reduced to a system of coupled non-linear partial differential equations and thereafter non-local similarity method is used to transform the problem, which is solved numerically using fourth order Runge-Kutta method in conjunction with shooting techniques. Parametric studies are performed to investigate significant effects of the flow control parameters on the fluid velocity and temperature respectively. Consequently, comparative analysis is also performed on the wall shear stress and local heat transfer of the present study with the available results. The results show that the inclusion variable viscosity and thermal conductivity, and radiative heat loss mechanism cause significant effects on the fluid flow velocity, temperature, wall shear stress and local heat transfer.

Keywords: Forced convection, Magnetohydrodynamic, variable viscosity and thermal conductivity, radiation, saturated porous medium, local non-similarity method.

Volume 30, (May, 2015), pp117 – 130

Hollow Anode Cascading Plasma Focus

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Abstract

Using the 3-phase model for each focus event, the 9-phase, two solid disc auxiliary anode cascading plasma focus has been extended to include holes at the center of each cascade anode (hereafter referred to as hollow anode cascading focus) with a view of increasing the neutron yield with each focus event. Results show that the hollow anode cascading focus like the solid anode exhibits good focusing characteristics, i.e. significant current dip, large voltage spike and fast radial piston speed. Comparing the neutron yields using established empirical scaling laws, the results show equal yield in the first focus phase, while the yield in the second and third focus phases is 1.7% and 2.8% respectively, lower than the solid anode.

Keywords: Cascading focus, Auxiliary hollow anode, 3-phase model

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**Extension of Einstein's Planetary Theory Based on Generalized
Gravitational Scalar Potential**

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Abstract

In this article, the generalized Einstein's radial equation of motion in the equatorial plane of the Sun is transformed to obtain additional correction terms to all order of c^2 to Einstein's planetary equation of motion and hence to the planetary parameters..

Keywords: Radial Equation, Planetary Equation, Planetary parameters.

Volume 30, (May, 2015), pp133 – 142

On Ionization and Porosity in MHD Couette Flow of a Two-Component Plasma

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Abstract

The effect of ionization and porosity on the field structure of two-component plasma is studied. The flow is initiated by a relative motion of two horizontal flat plates in the presence of a uniformly applied magnetic field. A fully developed, viscous, incompressible flow with no convection current applies and the profile together with the effect of ionization and porosity on the velocity, temperature and induced magnetic field studied for astrophysical and geophysical systems.

Keywords: Couette flow, two-component plasma, MHD, porosity, ionization

Volume 30, (May, 2015), pp143 – 148

The Nuclear Finite-Size Corrections to Energies of $n = 1$, $n = 2$ AND $n = 3$ States of Hydrogen Atom

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Abstract

The first order perturbative approach has been applied and the finite-size nuclear corrections of order of the scaling factors, ξ , ξ^2 and ξ^3 for $n = 1$, $n = 2$ and $n = 3$ energy levels respectively for the hydrogen atom, have been computed. Results show that as the energy levels increases, the effects of the finite – size nucleus on the orbiting electron is diminishing. This procedure has shown that the concept of finite nuclear size model has an extremely small impact on the energy spectrum of the hydrogen atom. Electron – nucleus interactions, beyond the coulomb potential, modify the atomic property and due to the change from point-charge to finite-size nuclear model the energy level of nucleus is shifted upwards and thus the atomic spectral line for a finite-size nucleus will not coincide with that of its point-size nucleus. This gives us more information on the nuclear charge distribution. Another observation from this work is that with a higher probability of being farther from the nucleus of finite – size charge, the orbiting electrons feel the same effect as the effects due to the point – charge

nucleus. Here the finite – size nuclear model have some relevance with the Schrödinger model of hydrogen atom at large distances from the nucleus.

Keywords: Schrodinger, perturbation, Hamiltonian, wave function, nucleus, point-size, finite–size, potential energy

Volume 30, (May, 2015), pp149 – 152

Diatomic Molecules Effective Potential for an Harmonic Oscillator Model

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Abstract

A model anharmonic potential was considered and was used in the Schrödinger time independent wave equation to describe a carbon monoxide molecule. Central difference scheme was used in approximating the derivative term in the Schrödinger equation leading to a tri-diagonal band system of equation. The method of LU-decomposition of Gaussian – elimination with back substitution was used to solve the system because it cannot be solved analytically. The effective potentials for large a show no unique turning point but as the value of a decreases, the effective potential shows unique turning point which suggest an approach to equilibrium point.

Keywords: Anharmonic, Model, Potential, Schrödinger, Carbon monoxide, Effective potential.

Volume 30, (May, 2015), pp153 – 160

Empirical Models for the Estimation of Global Solar Radiation in Yola, Nigeria.

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Abstract

In this research paper, monthly average global solar radiation measured on a horizontal surface (S), average daily temperature (T), average daily relative humidity (RH) and average daily wind speed (WS) for the interval of three years (2010 – 2012) measured using various instruments for Yola of recorded data collected from the Center for Atmospheric Research (CAR), Anyigba are presented and analyzed. Various

empirical models were developed; from the models developed, the model that contains the three variables gave the highest coefficient of determination of 76.5% which is $S = -141.885 + 0.1802RH + 22.297T - 167.5WS$. The suites of the empirical models were investigated that can be used to estimate the global solar radiation from the meteorological parameters obtained from Yola. Statistical package software SPSS version 16 was used for the regression analysis.

Keywords: Solar radiation, relative humidity, Temperature, Wind speed.

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A Qualitative Interpretation of Residual Magnetic Anomaly using Ground Magnetic Data

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Abstract

This research aims at analyzing and interpreting residual magnetic anomalies for the determination of subsurface geology of the area under study. We employed the use of ground magnetic survey method for the subsurface delineation of a location within Federal University of Agriculture, Abeokuta, an area of 6600m² with geographical coordinates of latitude 7.23707°N to 7.23777°N and longitude 3.43693°E to 3.43858°E. The magnetic data was collected using a G816 proton precision magnetometer. A total of 21 profiles were established along traverses. From these profiles it was seen that the intensities and characteristics nature of the magnetic anomalies, are indicative of the different rocks producing them. Analysis of residual anomaly graph reveals the existence of some structural features such as fault, fractures and contact between rocks and any other subsurface structure of the study area. When the anomaly is higher than the IGRF value, there is said to be a near surface magnetic material (igneous intrusion), but when the anomaly is below the IGRF value, then there is said to be a non-magnetic material such as fault, fracture, etc (sedimentary basin).

Keywords: Proton precession magnetometer, residual, anomaly, qualitative, IGRF

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Separation of Regional-Residual Anomaly Using Least Square Polynomial Fitting Method

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Abstract

This paper presents quantitative application of Least-Square Polynomial fitting method in regional-residual separation. The study area covered geographical coordinate between latitude 8°06'70"N and 8°06'98.7"N north and longitude 4°14'28.2"E and 4°14'56.9" east of the Aeromagnetic maps of the region. The data were obtained by digitizing the maps of the above areas, picking the Total magnetic values along the profile line, processed and analyzed. The result of the residual separation revealed that the area is underlain by a NE-SW regional trend, characterized by basement complex with a weak amplitude of approximately – 85.731 nT. The regional magnetic anomaly map shows that the southern part of the map is suspected to be sedimentary basin, which is W-E trending, an indication of smoother magnetic field and it masked off the effects of the stronger magnetic basement. The basement complex underlies between the north and south of the study area comprises of broader area of outcrops.

Keywords: Aeromagnetic map, Regional and Residual fields, basement complex, Polynomial fitting

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Estimation of Magnetic Basement Depth of Oyo Area from Aeromagnetic Data

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Abstract

This work involves the application of airborne magnetic data over Oyo town and its environ on geographical latitudes of 7°30'N to 8°00'N and longitudes of 3°30'E to 4°00'E south western Nigeria. The main objective of this study is to define the depth to the crystalline basement in the study area by means of the magnetic automated processing techniques. Locations and depths to magnetic contacts were estimated from the total intensity magnetic field using Horizontal gradient magnitude (HGM), Analytic signal amplitude (ASA) and Local wavenumber (LWN). The digitized magnetic intensity data of Oyo area, south western Nigeria was analyzed to estimate depths to magnetic sources as well as source locations. The total magnetic intensity values ranges from

-143.8 nT to 147.0 nT suggesting contrasting rock types in the basement complex. The magnetic basement depth results ranges from 0.528 km to 4.85 km for ASA, 0.674 km to 2.28 km for HGM while 0.0993 km to 1.69 km for the LWN method which overestimated source depths when compared with HGM and ASA functions. Thus, Oyo and its environs is dominated with basement rocks and have considerable variations both in the physical characteristics of rocks and structural geometries.

Keywords: Aeromagnetic, Local wavenumber, upward continuation, Geological structure, Magnetic susceptibility

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Beneficiation of Nigerian Clay with *Poly Anionic Cellulose-Regular (PAC-R)*

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Abstract

This paper documents the beneficiation of Nigerian clay from Emede in south south-Nigeria using PAC-R. The PAC-R was used in two concentrations and the effect of different concentration of Poly Anionic Cellulose-Regular (PAC-R) on the Emede clay was investigated. The experiment centred on the determination of its suitability for use in drilling mud formulation. Preliminary investigation suggests that Emede clay has a good potential for use in drilling operations when beneficiated appropriately.

Keywords: Niger delta sands, Emede clay, drilling mud

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Comparative Analysis of the Use of Banana Peels and NaOH in Ph Control In Nigerian Clays

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Abstract

This paper documents an investigation into the control of pH in drilling mud. The experiments were designed using local and imported additives, namely banana peels and NaOH, KOH. The clays used in the experiment were sourced locally from two Nigerian towns.

Ash produced from burnt banana peels were used as a substitutive for the industrial sodium hydroxide (NaOH) and potassium hydroxide, (KOH). The negative adverse effects of mud cuttings with inorganic additives on the environment have been demonstrated.

The ash were observed to be environmentally more friendly and readily degradable. It also showed an appreciable improvement of the pH of the drilling fluid from 5.0 -7.9 to 11.3.

Keywords: Nigeria, clay, biodegradable additives

Volume 30, (May, 2015), pp203 – 208

An Ideal Gas Law Simulator for Atmospheric Gas Molecules

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Abstract

The ideal gas law which is the equation of state of a hypothetical ideal gas that allows us to gain useful insights into the behavior of most real gases at low densities was utilized in this work to conceptualize, design and develop the ideal gas law simulator in a 3 dimensional space using Microsoft Visual Studio, Microsoft Paint and 3D Game studio for pedagogic purposes. The gas law variables due to changes in atmospheric conditions were simulated and the parameters considered in the developed software which visually depicts the motion of gas molecules could be modified by the user in order to see a visual representation of this effect on the other parameters. The developed software depicts adequately the visual representation of the motion of gas molecules based on changes in atmospheric conditions and the understanding of the thermodynamics of some of the trace gases in the atmosphere.

Keywords: ideal, hypothetical, simulator, pedagogic, visual

Computation and Simulation of Circuit Topology Describing Secular Equilibrium Decay

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Abstract

A circuit topology for simulation of artificial coupled differential equation of Secular equilibrium decay of Strontium was designed. The equilibrium decay considered was;



An integrating time constant of 33 millisecond was chosen so as to minimize integrating error and a maximum input voltage level of 10V was chosen for the design in order to avoid saturation of the Operational Amplifiers used for integrators, Amplitude and time scaling were employed on the differential equations in order to convert the equations to voltage sources, the amplitude scale factors of $K_{A1} = 3.3070 \times 10^{-3} \text{Vsec}$, $K_{A0} = 1.002 \times 10^{-1} \text{V}$, $K_{B1} = 13.1475 \text{Vsec}$ and $K_{B0} = 398.41 \text{V}$ were computed from the problem parameters, The Percentage error on the average of $\pm 0.9\%$ obtained in this research means that the circuit designed simulated the differential equation describing the Secular equilibrium decay for Strontium with a fairly reasonable accuracy.

Effects of Vaccine Efficacy on Basic Reproduction Number of a Vaccination Model of Tuberculosis.

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Abstract

This paper addresses the effect of vaccine efficacy rate on a vaccination model of tuberculosis (TB) epidemic. Numerical simulations was performed on the model using

Maple 15 computation software. Our results showed that as the levels of vaccine efficacy increase, the basic reproduction number, R_0 , decreases. This implies that if the protective effect of TB vaccine is increased, it would bring a lower R_0 . In consequence, there would be a steady reduction in the number of infectives and susceptibles while eradication of infection would be achieved in finite time. Graphical results are also presented and discussed qualitatively.

Keywords: Mathematical model, tuberculosis, basic reproduction number, vaccine efficacy, equilibrium points, stability.

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Modelling the Time Series Data of the Impact of the Infection Rate on the Viral Load of the Virions

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Abstract

The critical HIV infection of decreasing viral load of the virions due to the variability of the infection rate constant is a challenging health problem that can now be tackled computationally on the implementation of a numerical simulation indexed by a shorter experimental time in the unit of days. The results of this study are novel which have not seen elsewhere with the expectation of providing an insight on how this endemic health issue can be managed.

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Examining the Role of the Reproductive Rate of the Infected Cell On the Viral Load of The Virions In the Context of HIV/AIDS Intervention Strategy

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Abstract

The general variability of the reproductive rate of the infected cell on the viral load of the virions is a challenging medical science problem that requires the application of a mathematical reasoning using the technique of a numerical simulation. A decreased reproductive rate of the infected cell leads to the depletion of the viral load of the virions indexed by a time independent variable whereas an increased reproductive rate of the infected cell leads to the recovery of the viral load of the virions indexed by a time independent variable. These key results have not been seen elsewhere, they are reported and discussed in the body of this study.

Volume 30, (May, 2015), pp237 – 242

Residual Analysis of Generalized Autoregressive Integrated Moving Average Bilinear Time Series Model

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Abstract

In this study, analysis of residuals of generalized autoregressive integrated moving average bilinear time series model was considered. The adequacy of this model was based on testing the estimated residuals for whiteness. Jarque-Bera statistic and squared-residual autocorrelations were used to test the estimated residuals for whiteness. Generalized autoregressive integrated moving average bilinear time series model was fitted using non linear and non stationary series and the residuals were estimated. The independent test on estimated residuals showed that the residuals were independently distributed. The normality test on the estimated residuals also showed that the residuals followed a normal distribution. The tests on estimated residuals for whiteness were satisfied.

Keywords: Normality test, Residuals, Bilinear model, Jargue-Bera Statistic, Independent test

Volume 30, (May, 2015), pp243 – 250

Variation of Rainfall in Three Nigerian Stations, Using harmonic Analysis.

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Abstract

This work is on the variation of rainfall using harmonic analysis for Portharcourt, Kano and Makurdi data, for the three stations the period of study covered 1977 to 2010, for which the time series plot, the amplitude, the first, second and third harmonics were generated. Portharcourt has a gently increasing trend with periodicities of 5 years for the first harmonic, 3.5 years for the second harmonic and seventeen years for the third harmonic respectively. Kano showed a declining trend, while the periodicities were 3 years for the first harmonic, 3 years for the second harmonic and 18 years for the third harmonic respectively. Makurdi's semi-cyclical pattern has periodicities of 3 years for the first harmonic, 4 years for the second harmonic and 19 years for the third harmonic respectively.

Keywords: Rainfall, Variation, Harmonics, Periodicities.

Volume 30, (May, 2015), pp251 – 256

Grade-Average Method: A Statistical Approach for Estimating Missing Value for Continuous Assessment Marks

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Abstract

In this paper we propose an alternative way for finding an estimate of a missing score for continuous assessment mark of an examination so as to allocate an appropriate grade. We considered four different examinations and randomly selected five students of different class of grade in each, with their actual Examinations and Continuous Assessment Scores. The proposed grade-average method (GAM) is expected to be an unbiased or best estimator among the

various methods of estimating the missing Continuous Assessment score adopted by different teachers.

Keywords: Continuous assessment, grades, average score and standard deviation.
Volume 30, (May, 2015), pp257 – 262

Implementation of Multiple Separator Algorithm for Two Relational Operations.

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Abstract

This paper concerns the performance of two basic relational operations namely selection and projection operations for normalizing large relational data bases. The implementation of the multiple separator algorithm for these operations is considered. For this purpose a virtual query processor for composition relation is developed and appropriate user interface for query formulation while performing the operation is suggested.

Volume 30, (May, 2015), pp263 – 266

Formalization of Hostel Management System.

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Abstract

The automation of the processing and activities of Hostel Management System (HMS) can invariably contribute greatly to the success, profitability and customer-based approach of such an organization. The use of formal specification creates a formal approach for specifying the underlying functions and properties of the system. This paper has attempted to give a formal description of the activities of HMS system Using Zed notations. The interaction within the system is visualized using Unified Modeling Language (UML) sequence diagrams.

Keywords: HMS, Z-Notation, UML.

Fuzzification of Botulism.

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Abstract

Botulism is not age or gender restrictive. It has been seen over the years as a nerve toxin that is produced by the bacterium Clostridium botulinum and sometimes by strains of Clostridium butyricum and Clostridiumbaratii. Its symptoms vary from double vision to muscle weakness. This research paper proposes a fuzzy model and fuzzy rule approach for recognizing botulismutilizing the decision variables pertaining to botulism, thereby enhancing or extending the traditional (conventional) method. The result obtained based on the fuzzy scale was subdivided into three: "Botulism Absent", "Modest Botulism "and "Botulism Diagnosed". The proposed expert system eliminates uncertainties and imprecision associated with the botulism diagnosis usually tied to an individual professional which usually might be affected by individual state of mind, level of experience and acquired head-knowledge.

Keywords: Botulism, De-fuzzification, Diagnosis, Fuzzy, Fuzzification.

An Intelligent Clustering Based Methodology for Confusable Diseases Diagnosis and Monitoring

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Abstract

The combination of non-specific clinical manifestations that characterize confusable tropical disease and the probable lack of expertise and experience among physicians exponentially increases the potential for misdiagnosis and subsequent increased morbidity and mortality rates resulting from these diseases. In this paper, an intelligent system driven by fuzzy clustering algorithm and Adaptive Neuro-Fuzzy Inference System for the investigation, diagnosis and management of similar and confusing symptoms of confusable diseases was developed. Data on patients diagnosed and confirmed by laboratory tests of viral hepatitis (H), malaria (M), typhoid fever (T) and urinary tract infection (U) were used for training, testing and validation of the system. The system assigns patients with severity levels in all the clusters. Results on clusters validity are satisfactory. Overlapping symptoms analysis shows that symptoms of both H and T have highest degree of overlapping while symptoms common to M and U yielded the least impact. Symptoms common to M, H and T only, have equal impact

with that of M, T and U only. The symptoms that are common to all the four diseases under study yielded a 12.8% contribution to the degree of severity of each of the CTD diseases. The system compares favorably with diagnosis arrived at by experienced physicians and also provides patients' level of severity in each confusable disease and the degree of confusability of any two or more confusable diseases.

Key words: Confusable diseases; viral hepatitis; malaria; typhoid fever; urinary tract infection; Clustering, ANFIS

Volume 30, (May, 2015), pp 281 – 288

Design and Implementation of Open-Access Web-Based Education Useful for E-Learning in Nigeria

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Abstract

The current condition of our learning environment is in a deplorable state which is hardly conducive to normal study. The huge increase in student numbers in several institutions in Nigeria exceed the available seats in the lecture theatres coupled with inadequate public-address systems. The traditional learning method is not flexible as it does not permit access to educational resource at any time or place feasible. Additionally, most students possess personal computers which they use for social purposes instead of academic purposes.

In this paper, a web-based education useful for e-learning was designed and implemented to increase the scope and the effectiveness of traditional learning methods. It is also aimed to improve students-lecturers and students-students interaction academically, using an open source platform which will be more flexible, and cost effective due to free licensing. The programming languages used are VB.NET and Macromedia Dream Weaver MX2010 which are quite powerful and flexible for further developments.

The designed website was tested for usability, reliability, supportability, performance and functionality after linking the interfaces to the database and hosted using internet information server (iis). It was observed to have service requirements of online activities. Also, the system is flexible and allows for the integration of various tools and technologies.

Keywords: Web-based education; e-learning; system algorithm

Design and Implementation of a Web Based System for Orphanage Management

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Abstract

Majority of Orphanages and State Governments in Nigeria have been using paper logs and manual entries for tracking orphanage records. These methods make it difficult to efficiently manage orphan data and to inform decisions at different levels. This study is in two folds. We analyzed and examined the public perception of having a web based information system for orphanage management and also designed and implemented a web based system for management of orphanages. The system we developed keeps track of orphanages, the orphans, the helps received by the orphanages and members of the public who rendered these helps. The study also explored the role of orphanages and government towards orphan care in Edo State of Nigeria, identified the problems in the orphanages and suggested ICT measures that would improve the role of orphanages in orphan care.

Keywords: System, Web Based System, Orphanages, Orphanages Management, Design and Implementation

Effect of Adenine Concentration on the Corrosion Inhibition of Aisi 304l Steel in 1.0m Sulphuric Acid Solution

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Abstract

Over the years considerable efforts have been deployed to finding suitable (safe and friendly) corrosion inhibitors of organic origin in the various aggressive acid media encountered in service especially during the processes of pickling, industrial acid cleaning, acid descaling and oil well acidizing. In this research the effect of adenine concentration on the

corrosion inhibition of AISI 304L in 1.0 M sulphuric acid solution has been investigated. The research was achieved by using 1M concentration of acid solution and varied inhibitor concentration. Readings were obtained every 240hours (10 days) for a period of 1200hours (50 days). Weight loss, corrosion penetration rate, inhibition efficiency and degree of surface coverage were calculated. Results obtained revealed that adenine is an effective and safe corrosion inhibitor for AISI 304L in 1.0M sulphuric acid solutions. Analysis of the results showed that the inhibition efficiency and surface coverage increases with increasing adenine concentration till a certain maximum value, causing a decrease in corrosion penetration rate and weight loss. A maximum value of inhibition efficiency of 89.56% was achieved at 0.011M adenine concentration after 10 days. This gave a surface coverage of 0.8956 and corrosion penetration rate of 0.022132mm/yr. Hence, the best adenine concentration for the corrosion inhibition of alloys 304L in 1.0M sulphuric acid solution to obtain optimum inhibition efficiency is 0.011M.

Keywords: Corrosion, AISI 304L Steel, Inhibition efficiency, Degree of Surface coverage, 1.0M Sulphuric Acid Solution.

Volume 30, (May, 2015), pp305 – 314

Modelling Convergence of Finite Element Analysis of Cantilever Beam

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Abstract

Convergence studies are carried out by investigating the convergence of numerical results as the number of elements is increased. If convergence is not obtained, the engineer using the finite element method has absolutely no indication whether the results are indicative of a meaningful approximation to the correct solution. There are two major methods of mesh refinement; h-refinement and p-refinement.

The cantilever beam plate was modelled using Abaqus/CAE 6.12-1, a finite element analysis tool. The geometry consists of a 300 x 100 mm beam section, spanning 3m and fixed at one end. A load of 1kN was applied at the free end. Also the model was meshed using 2D plane stress linear and quadratic quadrilaterals elements (CPS4R and CPS8), triangular elements (CPS3 and CPS6) and refined. For the linear quadrilateral element, a total of 20, 40, 160 and 2560 elements were used for the coarse, medium, fine and very fine mesh respectively. Total numbers of 33, 63, 205 and 2737 nodes were generated accordingly.

The maximum bending stresses and shear stresses occurred at the fixed end. Exact stress and maximum displacement value at the mid-top fibre and free end of the beam was 100 N/mm² and -19.5122 mm respectively. Simulated results at these points were analysed using the four element types at different mesh refinement levels. The study shows that linear FE converges slower compared to quadratic elements. Also a finer mesh is

required to predict accurate stresses than is needed to calculate accurate displacements.

Keywords: Cantilever beam, finite element, Abaqus, convergence, stress, strain.

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Determination of the Optimum Thickness of Approximately Cylindrical Top Spherical Frustrum Aluminium Cast Pot

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Abstract

In an attempt to conserve the world's scarce energy and material resources, a balance between the cost of heating a material and the optimum thickness of the material becomes very essential. One of such materials is the local cast aluminium pot commonly used as cooking ware in Nigeria. This paper therefore sets up a model that relates the thickness of a pot with the cost of heating it. The model is then computer simulated to determine the variation of heating cost with pot's thickness. The result shows an optimum thickness of 0.064 m for a pot of volume $2.405 \times 10^{-5} \text{ m}^3$. This is the thickness at which the cost of heating the material is cheapest, without an adverse effect on the thermal conductivity of the material. Above or below this thickness, the cost of heating is high making such thicknesses uneconomical. So, 0.064 m is the recommended optimum thickness for a pot of $2.405 \times 10^{-5} \text{ m}^3$ capacity for the makers of cook ware. The optimum thickness for a different volume of pot can also be obtained from the model when computer simulated.

Keywords: Cost of heating, optimum thickness, cast aluminium, computer simulation

Volume 30, (May, 2015), pp323 – 328

Effect of Cement Grades on some properties of Sandcrete

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Abstract

The purpose of this study is to investigate the effects of cement grade on some properties of sandcrete. The cement used for this work was Ordinary Portland cement (Dangote brand) of grade 42.5 and 32.5 meeting the requirement of ASTM C150 type 1 cement. Three types of fine aggregate was also used to produce sandcrete cubes which includes Ovbiogie sharp sand, Okhuahe sharp sand and Iguosa river erosion sand all obtained from Benin city, Edo state, Nigeria. Sieve analyses were carried out on the three fine aggregate samples which fell under zone 3 according to BS 882:1954. Sand/cement ratios of 1:6, 1:8 and 1:10 were used to produce a total of 216 samples of 150mm x 150mm sandcrete cubes. The work studied the compressive strengths of the various sandcrete cubes at curing ages of 1, 3, 7 and 28 days respectively.

The results obtained using grade 32.5 cement at 7 days with sand/cement ratio 1:6 are 3.48N/mm², 3.30N/mm² and 3.21N/mm² for Ovbiogie sand, Iguosa sand and Okhuahe sand samples respectively. For sand/cement ratio 1:8, the compressive strength of the sandcrete cubes are 3.03N/mm², 2.34N/mm², and 2.43N/mm² for Ovbiogie sand, Iguosa sand and Okhuahe sand samples respectively. These met the Nigerian Industrial Standard (NIS, 1975) for load bearing blocks and non-load bearing blocks. Using grade 42.5 cement, the results also obtained, for 7 days with sand/cement ratio 1:6 are 6.52N/mm², 6.03N/mm² and 6.22N/mm² for Ovbiogie sand, Iguosa sand and Okhuahe sand samples respectively. For sand/cement ratio 1:8, the compressive strength of the sandcrete cubes are 5.48N/mm², 3.69N/mm², and 2.89N/mm² for Ovbiogie sand, Iguosa sand and Okhuahe sand samples respectively. These also met the Nigerian Industrial Standard (NIS, 1975) for load bearing blocks and non-load bearing blocks. This study has shown that cement grade does not translate to sandcrete strength.

Volume 30, (May, 2015), pp329 – 336

Application of Response Surface Methodology for Optimizing Oil Extraction Yield From Tropical Almond Seed

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Abstract

This study investigated the optimum processing conditions which give the maximum yield of oil extracted from tropical almond seed by the use of response surface methodology (RSM). The factors investigated were solvent concentration (50 – 100% v/v), extraction temperature (84 -100°C) and processing time (60 – 120 min). Central composite design (CCD) was explored to get the optimum conditions for the extraction of the almond seed oil via soxhlet extraction. Solvent concentration, extraction time and one factor interaction term of the concentration exhibited significant effects on the yield of almond seed oil with coefficient of determination (R^2) of 0.9504. The model adequacy was further checked using the adjusted R^2 which gave a value of 0.9058. Optimum conditions for extraction, ascertained by RSM were 89% solvent concentration, 90°C extraction temperature and 107 min extraction time. The calculated predicted results were close to the experimental results which further validate the developed mathematical model.

Volume 30, (May, 2015), pp337 – 342

Design and Construction of a Talking Clock

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Abstract

Most of the time-measuring instruments which have been developed give information about time visually. This denies the visually impaired the ability to keep track of time and as such makes him unable to manage time. This paper presents a design and construction of a Talking Clock. The design incorporates both audio and visual function which will enable the visually keep track of time. ICs such as microcontroller (PIC18F4620), voice chip (ISD17240), Real Time Clock (PCF8583), LCD Screen and other discrete components were used in designing the project. The circuit diagram and components were chosen after a considerable research was done to ensure efficient operation of circuit and low cost.

Keywords: Microcontroller (18F4620), Voice Chip (ISD 17240), RTC (PCF8583), LCD display, visually impaired

Volume 30, (May, 2015), pp343 – 348

Design and Construction of a Temperature and Pressure Data Acquisition System

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Abstract

It is sometimes necessary for physical parameters such as temperature and pressure to be monitored especially in systems where performance relies on the values of these parameters. Hence it is necessary to design systems that can monitor these physical parameters. In this work, a temperature and pressure monitor is designed. The system takes in temperature and pressure readings from the temperature sensor (LM35) and the pressure sensor (MPX4115A) respectively. The temperature and pressure readings are processed by a microcontroller (PIC16F877A) and displayed on an LCD. The readings are also sent through RS232 serial communication protocol to a graphical user interface (GUI) on a computer which displays the temperature and pressure readings in graphical form. The system was designed, tested and found to work properly.

Keywords: Graphical User Interface, LM35,MPX4115A, RS-232 Communication protocol, PIC16f877A.

Volume 30, (May, 2015), pp349 – 356

Design and Construction of a Home Automation System Using a Smart Phone

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Abstract

Home automation system involves introducing a level of computerized or automatic control to certain electrical and electronic systems in the home. These include lighting, temperature control, and so forth.

This project is aimed at designing and constructing a microcontroller based home automation system, used to turn on and off the home electrical appliances when the temperature rises above or falls below a preset temperature range (between 25°C and 30°C). The inputs signals from both the temperature sensor LM35 and the signal sent from the bluetooth connection of the Android smart phone to the HC-05 Bluetooth Module serves as inputs to the microcontroller. Output units which comprise of the Liquid Crystal Display (LCD) and the relays which powers on and off the fan and bulbs, are incorporated in the circuit to make the results of test visible and complete the system design for the smart home. The result of the test shows that the system automatically switched on and off light bulbs, turned on sockets and a.c fans at the preset temperature value (below 25°C and above 30°C) through the LM35 temperature sensor. And through the HC-05 bluetooth module the system was able to switch on and off the home appliances.

Keywords: Home automation systems (HASs), Smart home, home appliances, Bluetooth, Android.

Volume 30, (May, 2015), pp357 – 360

Dynamic Calculation Design of Vertical Wind Turbine

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Abstract

The Nigeria power system is facing shortage of power due to poor generation. The country is now trying to shift to the utilization of renewable energy in the production of electrical power so as to have a mix energy generation system. One of the renewable energies is the kinetic energy of wind. For this energy to be properly utilized there is need for flexibility in the design of the turbine that will be used to convert the kinetic energy of the wind to electrical energy. Although, this work did not give enough wattage needed, it is still important to talk about the importance of the dynamic calculation of the wind turbine. However, for this flexibility to be achieved there is need for proper understanding of the dynamics of the turbine. This paper presents, from practical point of view, the dynamic calculation for a vertical wind turbine which is basically an implementation of the idea in [4]. The site for this work is Benin City, Edo state Nigeria.

Keywords: Induction Motor, Turbine Blades, Mechanical Coupling, Wind Energy, Bearings.

Volume 30, (May, 2015), pp361 – 366

Automatic Multiphase Selector Using PIC16F876 Peripheral Interphase Controller

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Abstract

Power inconsistency in developing Nations like Nigeria has created the current use of other sources of power like generating set, inverters, wind mill to mention but few. Not only is power failing, phase inconsistency is another alarming condition in the country. This had led many to stay in light out condition even when there is

availability of power. The cause of changing over from one phase to the other or to a generating set often results to time delay and equipment damage. This paper presents the design and construction of an artificial intelligent multiphase selector that switches electric supply from one phase to another within public supply and to a Generator in the situations of power outage or abnormal power supply. This system is made up of relays being controlled by a microcontroller as the brain.

Key words: Microcontroller, Transistor, Relay, Public Supply, Generator, Rectifier

Volume 30, (May, 2015), pp367 – 372

Design and Construction of Remote Control for Lighting System Using Infra Red

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Abstract

The study investigates the design, construction and testing of a lighting system using infra-red remote control. A single channel remote control is used to control the switching of a lighting system connected to the output of an Infra-red receiver. An Infra-red beam is modulated by an oscillator (NE 555 timer IC) and transmitted to a remote sensor (TSOP1738). This signal is amplified by a transistor (BC 558) and then delivered to the decade counter (CD 4017 IC) via its clock input terminal. The transistor output is fed to an electro-mechanical relay which does the switching of the load. The system is found to be effective and operational within the range of 0.01 m to 10 .05 m in accordance with the design specifications.

Keywords: Infra-red, remote control, Transistor, Integrated circuit.

Volume 30, (May, 2015), pp 373 – 378

Power Budget Analysis of Fiber Optics Communication Links Along Benin-Asaba Route

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Abstract

With the development of optical fiber communication system most telecommunication companies now prefer to use optical fiber transmission medium for higher information bandwidth. The design of such a system involves many aspects such as the type of source to be used, the kind of fiber to be employed and detector. The designer must select from a set of device components to meet a given set of system requirements, one of which is the power budget analysis. In this work, four different optical fiber communication links under limited attenuation condition were studied. The design parameters include; power budget analysis, maximum link length. A power margin greater than four decibel was obtained; this indicates a healthy margin of signal strength.

Key words: Optical Networks, Fiber Optical Communication, Power Budget, Maximum link length.

Volume 30, (May, 2015), pp 379 – 388

Load Flow Analysis of a 15Mva Injection Substation

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Abstract

This study presents the load flow analysis of Otovwodo 33/11kV injection substation, Nigeria. It is an obvious fact that the planning, design and operation of power systems require load flow calculations to analyze the steady state of the system under various operating conditions, and equipment configuration. This load flow helps to determine the state of the power system for a given load and generation distribution. This paper presents the computer aided power flow analysis of the existing Otovwodo33/11kV distribution network using the ETAP 7.0 software. The result showed that out of 91load feeders of which 6 is out of service, voltage violation occurred in all for peak period but for off-peak period, fifty five (55) violation was recorded while thirty (30) was within the statutory voltage range.

Key words: load flow, ETAP, voltage, and buses.

Volume 30, (May, 2015), pp 389 – 398

Design and Construction of an Automatic Three-Phase Change Over Voltage Stabilizer

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Abstract

This paper presents the design and construction of an automatic three-phase change over voltage regulator capable of maintaining constant output voltage of 220V with current range of 5-12A. Its output power rating is about 3200W. The input is capable of searching and selecting a live phase from the mains voltage source of readily available power transmission line. The device can also amplify input voltage as low as 50V a.c to a constant 220V a.c. Furthermore, if no power is sensed, from the three live phases, that is if all the phases are in OFF STATE, the device auto-connect to a power generating plant.

Key words: Power Supply; stabilizer; phase Change-over Switch.

Volume 30, (May, 2015), pp 399 – 408

Design and Simulation of a PIC16F877A and LM35 Based Temperature Virtual Monitoring System Using Proteus (Labcenter Electronics)

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Abstract

This paper describes the design and simulation of a temperature virtual monitoring system using proteus (Labcenter electronics). The device makes use of the PIC16F877A, LM35, 2x16 LCD and other discrete components. The lm35 serve as the temperature sensor, whose output is fed into the PIC16F877A for further processing. The result from the microcontroller (PIC16F877A) is then displayed on the 2x16 LCD.

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Extension of Newton's Dynamical Spectral Shift for Photons in Gravitational Fields of Static Homogeneous Spherical Massive Bodies

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Abstract

In this article we applied the generalized dynamical gravitational scalar potential exterior to the body for static homogeneous spherical massive bodies to obtain general dynamical gravitational spectral shift for photons. The results are that a recession leads to a redshift while approach leads to a blueshift which is perfectly in agreement with the physical fact that gravitational scalar potential is negative and increase in recession leads to decrease in kinetic energy and hence decrease in frequency.

Keywords: Generalized Gravitational Scalar Potential, Spherical Massive Bodies, Generalized Gravitational Spectral Shifts, Photons, Redshift and Blueshift

Volume 30, (May, 2015), pp413 – 420

A Mathematical Model for the Prediction of Injectivity Decline

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Abstract

Injectivity impairment due to invasion of solid suspensions has been studied by several investigators and some modelling approaches have also been reported. Worthy of note is the development of analytical models for internal and external filtration coupled with transition time concept for predicting the overall decline in injectivity.

This study presents a new mathematical model which is based on mass balance of particles flowing through the porous media by coupling rate changes in injection pressure within the reservoir due to formation damage with rate changes in porosity within the invaded region. This model when fully validated will ensure the reliability of injectivity decline prediction from a well injectivity index history which will further pave way for an effective planning

of water treatment whereby creating a new frontier in the management of produced water in oil and gas technology.

Keywords: Injectivity impairment; internal filtration; External filtration; water injection; filter cake; porosity reduction; formation damage; injection decline

Volume 30, (May, 2015), pp421 – 426

Application of Analytic Function in two Dimensional Horizontal Flow of Complex Potential in a Cylinder

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Abstract

The application of flow equation to analytic function enables one to see physical applicability of complex analysis. This work provides solution to physical problem in fluid flow that formalizes the idea of motion of fluid element.

Harmonic functions are used to study fluid flow under the assumption that an incompressible and frictionless fluid, flows over the complex plane and that all cross sections in planes parallel to the complex are the same. Conformal mapping is used to transform a region in which the problem is posed to the one in which the solution is easy to obtain.

Keywords: Complex Potential, Analytic function, harmonic function, conformal mapping, irrotational

Volume 30, (May, 2015), pp427 – 430

On Bond Pricing with Jumps in Interest Rates

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Abstract

The pricing of zero coupon bonds when the interest rate in the market is given by a jump-diffusion stochastic process of CIR-type is considered. The jump is assumed to be a Levy process of exponential type with no drift. Solving the associated partial integro-differential equation for the bond price, a semi-analytical expression, involving the Levy exponent, is obtained. Numerical experiments show that, with the same set of parameters, the bond price is higher with jump interest rate than with Gaussian interest rates.

Keywords: Levy process, zero coupon bond, characteristic exponent, variance gamma

Volume 30, (May, 2015), pp431 – 438

The Impact of a Time Delay on the Depleted Proportion of the Viral Load of the Virions Due to a Decreased Reproductive Rate of the Infected Cell

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Abstract

While the impact of the variability of the reproductive rate of the infected cell on the viral load of the virions is an on-going research activity, the inclusion of a time delay which mimics the African culture of diverse health inhibiting belief system is a new numerical simulation perspective of solving the mathematical problem and the health policy dimension of HIV/AIDS intervention strategy. The full results of this study which one has not seen elsewhere are presented and discussed in this paper.

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Qualitative Behaviour of a Mathematical Model of Interacting Populations with Environmental Perturbation

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Abstract

The phenomenon of the interaction between two (2) populations indexed by the unit of time is as old as the famous Lotka-Volterra formalism. However, the qualitative analysis of interacting populations under the simplifying assumption of environmental perturbation is formidable mathematical problem which requires the application of a numerical simulation. The details of this present novel contribution are presented and discussed in this study.

Volume 30, (May, 2015), pp443 – 448

Effect of Cu and Co Doping on the Structural Properties of ZnO Nanoparticles

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Abstract

Cu_xCo_{0.1}Zn_{0.9-x}O nanoparticles with different doping concentration (x=0.0, 0.05, 0.1, 0.15, and 0.2) has been successfully synthesized by microwave assisted combustion synthesis method using urea as a fuel. The structural, morphological, and compositional properties of these nanoparticles were investigated by X-ray diffraction (XRD), Scanning electron microscopes (FE-SEM JEOL-7001), and Energy-dispersive X-ray spectroscopy (EDX), respectively. The structural properties showed the formation of Wurtzite structure of ZnO, with nine prominent peaks in which the strong diffraction peaks appear in (100), (002) and (101), respectively, there is a trace related to the Cu ions is observed and its diffraction peak increase with an increase in Cu concentration. The average size of the nanoparticles was estimated using Debye-Scherrer's equation where the average size lie between 32.65 and 41.15nm. Scanning electron microscopes (SEM) showed that smaller crystallites have sizes smaller than 100nm, no indication of phase separation and little agglomeration was observed. Moreover,

Energy-dispersive X-ray spectroscopy (EDX) confirmed that the chemical composition of the samples tallies with the synthesis results.

Keywords: Nanoparticles, Zinc oxide, Semiconductor, Combustion synthesis method, Structural properties

Volume 30, (May, 2015), pp449 – 454

Overcoming Spurious Regression Using time-Varying Fourier Amplitude Approach

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Abstract

Non-stationary time series data have been traditionally analyzed in the frequency domain by assuming constant amplitudes regardless of the time-lag. A new approach called time-varying amplitude method (TVAM) is presented here. Oscillations are analyzed for changes in the magnitude of Fourier Coefficients which are analyzed for predictive and diagnostic purposes. To obtain an estimate for the time varying changes in the Fourier Coefficients of non-stationary data, a weighted least square approach produced results from an empirical data that are now presented. Time-varying Fourier Transform are presented in the new Adaptive Scheme. Results from the Adaptive Amplitude model showed a decrease of over 40% in the fitted error sum of squares compared with result from the traditional or classical method with constant amplitude. More importantly, time-varying amplitude model has eliminated the spurious regression syndrome that has plagued non-stationary signals when modelled by Fourier analysis Method.

Keywords: Classical Fourier Coefficients. Cosine and Sine Transforms, Spurious regression, Time-Varying Amplitude Model

Volume 30, (May, 2015), pp455 – 462

The Numerical Solution of an Abelian Ordinary Differential Equation by a New Hybrid of ADM and Its Comparism with some Standard Numerical Scheme

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Abstract

In this paper we present a relatively new technique call theNew Hybrid of Adomian decomposition method (ADM) for solution of an Abelian Differential equation. The numerical results of the equation have been obtained in terms of convergent series with easily computable component. These methods are applied to solve some problem represented as Abelian differential equation and the current results compared with an established Runge-kutta of order IV in order to verify the accuracy and also with Actual solution. This findings confirm that some know methods and the New Hybrid are powerful and efficient tools for solving Abelian differential equation.

Keywords: Abelian differential equation, Adomian decomposition method, Runge-kutta of order IV, New hybrid ADM.

Volume 30, (May, 2015), pp463 – 466

Computational Error Estimate for the Power Series Solution of Odes Using Zeros of Chebyshev Polynomial

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Abstract

This paper compares the error estimation of power series solution with recursive Tau method for solving ordinary differential equations. From the computational viewpoint, the power series using zeros of Chebyshevpolunomial is effective, accurate and easy to use.

Keywords: Lanczos Tau method, Chebyshev polynomial, initial value problems, Lanczos – Ortiz Canonical polynomial, Ordinary Differential Equations

Volume 30, (May, 2015), pp467 – 476

Modelling Monthly Mental Sickness Cases Using Principal Component Regression Method

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Abstract

This study was carried out to solve the problem of inadequate data information on the monthly mental sickness cases at the Federal Neuro-psychiatric Hospital, Kaduna. This research tackled this problem by deriving a model from the data obtained that can be used to predict Monthly Total Observation of mental illness that will enhance effective mental health management, logistic planning and assist in decision making process. The methodology was principal component analysis (PCA) using data obtained from the hospital to estimate regression coefficients and parameters. It was found that the principal component regression model that was derived was good predictive tool. The principal component regression model obtained was okay and this was corroborated by large coefficient of determination (R^2), predictive power and forecast results.

Keywords: Principal component analysis, mental illness, factor loading, eigenvalue, eigenvector regression, forecasting, variance inflation factor

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Computer Implementation of the Two-Factor DP Model for Manpower Planning

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Abstract

In this paper, a two-factor dynamic programming (DP) model for manpower planning is presented in linear programming (LP) form. It has been observed that practical problems formulated as

usually have too many variables and constraints which make their manual solutions cumbersome. The manpower problem presented in this paper has many constraints and variables but is highly sparse having very few non zero coefficients in its matrix. A computer program known as Program Simplex which takes advantage of this sparseness has been applied to obtain an optimal solution to the manpower planning problem presented. It has also been observed that LP models with few nonzero coefficients can easily be solved by using a computer to obtain an optimal solution.

Keywords: Dynamic programming, manpower, wastage, recruitment

Volume 30, (May, 2015), pp489 – 496

Assessing the Performance of Global Solar Radiation Empirical Models at a Sahelian Site, Sokoto, Nigeria

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Abstract

In the region where solar radiation data are scarce, the next alternative method is to use solar radiation models to estimate the data needed for some applications such as simulation of crop performance and the design of solar energy conversion devices. In this paper, the validations of fifteen models for estimating monthly mean daily global solar radiation on the horizontal surfaces were conducted at a location in sahelian region where there is great potential for solar energy utilization in electricity generation and irrigation. Evaluations of these models were carried out by using the Mean Bias Error (MBE), Root Mean Square Error (RMSE), Mean Percentage Error (MPE) and t-test. Three of these statistical performance indicators were combined to generate rank score for each model. Temperature based models made the rank of the best three during the wet season. On the annual scale and in the dry season, temperature variations and humidity were combined with sunshine duration to get the best rank of 1 to 3.

Keywords: Solar radiation, empirical models, climatic parameters, sahel.

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Effects of Deposition Potential on the Optical Properties of Zinc Sulphide (ZNS) Thin Films and Its Physical Applications Using Electrodeposition Technique

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Abstract

Thin films of Zinc Sulphide (ZnS) were grown on glass substrate by electrodeposition technique. The optical characterization of the grown films (ZnS) was done by using a Janway 6405 UV-VIS spectrophotometer in the range of 300-900nm using a step size of 20. The effect of deposition potential variation on the films optical properties such as transmittance, reflectance and absorption coefficient squared were calculated. The absorbance of the films was found to be in the range of 0.1-0.9%, while the transmittance and reflectance were found to be in the range of 0.1-0.9% and -0.01-0.2% respectively. The average band gap energy was also determined to be 2.8eV.

Keywords: Optical properties, Thin Film, Indium doped Tin oxide (ITO), Electrode position.

Volume 30, (May, 2015), pp505 – 514

Heat Transfer to Pulsatile Slip Flow in a Porous Channel Filled With Porous Media

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Abstract

This paper investigate the effect of slip on the hydromagnetic pulsatile flow through a porous channel filled with saturated porous medium with time dependent boundary condition on the heated wall. Based on the pulsatile flow nature, the dimensionless flow governing equations are resolved to harmonic and non-harmonic parts. Exact solutions are obtained for the temperature and velocity fields. Parametric study of the solutions are conducted and discussed.

Keywords: Pulsatile flow, Navier slip, porous medium, heat transfer, magnetic field, thermal radiation.

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A Mathematical Model for the Comparative Study of the Blast Response of Aluminium and Steel Panels

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Abstract

This paper presents a mathematical model of the study of the blast response of aluminium and steel panels. These panels are deemed sufficient to provide protective barrier against explosions, especially from terrorists. With the maximum deflection being the damage criteria used, the behaviour of both panels is studied.

The panels are reduced to single degree of freedom system using assumed mode approach. Corresponding mass, stiffness and effective load from blast are formulated. The corresponding single degree of freedom (SDOF) equation structural dynamics problem is solved using Newmark- β integration scheme.

The results show an increase in blast protection with increasing thickness of panel, and increasing mass. It is also established that boundary conditions have significant effect on the blast response of the panels. This work serves as preliminary guide in designing blast protective panels.

Keywords: Single Degree of Freedom (SDOF), Elastic-plastic, Resistance Function, Numerical Integration.

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Erratum: Comparative Analysis of Some Reliability Characteristics of Deteriorating Systems

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The address of the Authors in this paper was wrongly typesetted in the vol. 29 issue of the Journal of NAMP. The first page of the article is therefore reproduced as it ought to appear on page 259 (Vol. 29)

Abstract

In this paper, probabilistic models for a system with different stage deteriorations have been developed to analyze and compare some reliability characteristics. Three configurations are studied under the assumption that each state that is working in reduced capacity is minimally repaired and the system is replaced at failure. Configuration 1, configuration 2 and configuration 3 have one (major), two (minor and major) and three (mild, minor and major) stage deteriorations respectively. Explicit expressions for mean time to system failure (MTSF) and steady state availability ($AV(\infty)$) are analyzed using kolmogorov's forward equation method. Comparisons are performed for specific values of system parameters. Finally, the configurations are ranked based on MTSF and ($AV(\infty)$) and the results show that configuration 3 is optimal.

Keywords: Reliability, Availability, Deterioration, Repair, Replacement.