

TABLE OF CONTENT

1. Coefficient Estimates for New Subclasses of Ma-Minda Bi-starlike Functions by O. A. Fadipe-Joseph, Y.O. Afolabi and B. O. Moses (pages 1-7)
2. Analysis of Diffusion Approximation for Queues and Its Application by S. S. Daodu, J. N. Ugwu, K.C Ukaoha and O. Folorunsho (pages 9-18)
3. Application of Multi-Set to loglinear models for arbitrary d-Dimensional Contingency Table and its Associated Closed-Form Formula for Parameter Estimations by O.C. Okoli, N. A. Nsiegbe and M. Laisin (pages 19-26)
4. Incorporating Spatial Structures in the Analysis of Two Sets of Experimental Data by Ojurongbe T.A and Bashiru K. A (pages 27-34)
5. Bayesian Minimum Message Length⁸⁷ with Parametric Heteroscedasticlinear Model by Oloyede I. (pages pp 35 – 44)
6. Analysis of One-Dimensional Abrasive Wear Rate in Hot Forging Process by C.I. Oviawe and J.A. Akpobi (Pages 45 – 56)
7. Comparison of Numerical Algorithms for Solving Non-Linear Equations by (Pages 57 – 60)
8. An Alternative Solid Waste Management System in Nigeria: A Case for Local Production of Solid Waste Derived Fuel (SWDF) - (pages) 61 – 70
9. The Effect of Sputtering Parameters on the Hardness and Fracture Toughness of Copper Oxide Thin Films Prepared by Reactive Magnetron Sputtering by T.H. Darma (pages 71-78)
10. A Survey of the Mathematical Equations of Coronal Mass Ejections (CMEs) by Said R.S, Okoli N. A. and Ekwubiri E.C (pages 79-82)
11. Electronic Structure and Properties of 2Hydroxyanthracene in Gas Phase and in Ethanol: RHF and DFT Study by Umar Gurku and Chifu E. Ndikilar (pages 83-94)
12. Taxonomy of P2P Networks and their Associated QoS Parameters by Adamu Aminu and Ahmed Jamilu Bashir (pages 95 – 100)
13. Credit Card Fraud Detection Using Firefly Algorithm by Olusegun Folorunso (pages 101-106)
14. A Genetic Algorithm for Optimization of Trust- Based Knowledge Sharing Adoption Model by Olusegun Folorunso (pages 107-114)
15. Stochastic Analysis of Heterosexual Transmission of HIV/AIDS Epidemic in The Presence of Treatment by Bashiru K.A and Ojurongbe T.A (pages 115 -122)
16. Fuzzy Logic Diagnostic System for Disease Detection by Daodu S. S., Ukaoha K. C., James T. R. and Amadin I. F.(pages 123-128)
17. Development of a Water-Based Drilling Fluid for Shale Reservoirs with Emede Clay by P.N. Onwuachi-Iheagwara (pages 129-136)
18. Evaluation of Groundwater Potential Using Electrical Resistivity Method in Awo-Osun Community, Ile-Ife, Southwestern, Nigeria by Samuel Omosule Sedara and Olusegun Olalekan Alabi (pages 137 - 146)
19. Thermodynamic Properties Prediction of the Bulk Modulus Of Sediment-Hosted Disseminated Gold Deposits by A.A. Adetoyinbo and A.K. Bello (pages 146-160)
20. Measurement of Natural Radioactivity levels in the Topsoil of Abandoned Tantalite Mine in Southwestern, Nigeria by Olowookere C. J., Adeoje E.A., Jibiri N.N. and Igboama W.N. (pages 161-166)

21. Effect of High Temperature on the Residual Strength Properties of Concrete by R. I. Umasabor and O.E. Alutu (pages 167-172)
22. Effect of Cement Grades on some Strength Properties of Concrete by R. I. Umasabor and O.E. Alutu (173-178)
23. Fullerene Production from Pyrolysis of Chlorodifluoromethane by A. U. Agobi¹ and A.J. Ekpunobi² (Pages 179-184)
24. Production, Characterization and Prospect Applications of Coal Nanoparticles by A. U. Agobi¹ and A.J. Ekpunobi (Pages 185-190)
25. Preliminary Design of a Small Scale Integrated System for Palm Oil Extraction by O. Osaze, N. Enoma and C. Kwasi-Effah (Pages 191-194)
26. Modelling Energy Effects During Ethanol Fermentation Coupled with in situ Gas Stripping by Amenaghawon N.A, Osazuwa U.O. and Osayuki-Aguebor W (Pages 195-200)
27. Modelling Continuous Ethanol Fermentation: Effect of Dilution Rate and Optimisation of Substrate Consumption by Amenaghawon N.A, Osazuwa U.O. and Osayuki-Aguebor W (Pages 201-206)
28. Measuring the Value of ICT in the Nigerian Service Industry by Victor A. Olutayo¹ and Godspower O. Ekuobase (Pages 207-212)
29. Measuring ICT Maturity of Nigerian Service Firms Using ICT Maturity Model of SMEs and the Analytical Hierarchical Process Model by Godspower O. Ekuobase¹ and Victor A. Olutayo (Pages 213-222)
30. Modelling Permeability with Porosity and Grain Size Diameter by Alabi O.O and Olayiwola M.O (Pages 223-230)
31. Variation of Natural Gamma Radiation with Vertical Height by Idris Ahmad, Y.Y. Ibrahim, Ibrahim Abdullahi (Pages 231-240)
32. EOQ Model for Deteriorating Items that Exhibit Delay in Deterioration with Discrete Time by Yakubu M.I and Sani B. (Pages 241-250)
33. A Tutorial Survey on the Fractional Order Derivatives of Exponential And Trigonometrical Functions by M. L.Kaurangini, M.Y.Muhammad and M.Z. Ringim (Pages 251-254)
34. On Application of Differential Transform Method: A Modified Approach to Solution of Certain KdV Equations by M. I. Modebei¹, I. Otaide, O.O. Olaiya, E. J. Ejiofor (Pages 255-262)
35. On Soft Lattice Theory by A.M. Ibrahim¹ and A. O. Yusuf (Pages 263-270)
36. The Exponential Paraletrix by M.O. Oni¹ and A.Aminu (Pages 271-278)
37. Paraletrix Linear Space by M.O. Oni and A.Aminu (Pages 279-284)
38. Geophysical Determination of Sand Deposits Using 2-Dimensional Electrical Resistivity Imaging in Ologbo Area of Edo State, Nigeria by Ezomo F.O., Adagbon J.E. and Abriku E.O (Pages 285-290)
39. Geophysical Image Investigation of Salt/Brackish Water Intrusion into Freshwater Aquifer in Lagooncoastal Region: A Case Study of University of Lagos, Nigeria by Olorode D. O. and Ugwoke C.C (Pages 291-300)
40. Performance of a Reservoir Subject to Simultaneous Two-Edged and Bottom Water Drive Mechanisms Edo, T. M and Adewole E. S (Pages 301-310)
41. A Study of Pressure Derivatives Distribution of a Horizontal Well Subject To Simultaneous Two-Edge And Bottom Water Drive Mechanisms by Edo, T. Mand Adewole E. S (Pages 311-316)
42. Measurement of Activity Concentrations of ⁴⁰K, ²²⁶Ra and ²³²Th For the Assessment of Radiation Hazards from Dangora Surface Soils by Sadiq Abubakar Muhammad (Pages 317-324)

43. Radiation Effective Doses To Caregivers Of Patients On ^{131}I (Radioiodine) Therapy For cancer of The Thyroid at University College Hospital (UCH), Ibadan, Nigeria by Jibiri, N.N, Lawal, I.O and Olowookere, C.J (Pages 325-330)
44. Calculation of Concentration-Concentration Fluctuation $\text{Sc}(0)$ And Deviation In $\text{Sc}(0)$ from Ideal Solution Values Using Two Atoms Cluster Model (TACM) For Li-Mg and K-Na Liquid Alloys by O.W. Abodunrin and S.S. Oluyamo (Pages 331-336)
45. Higher Order Conditional Probabilities In Molten Alloys by O.W. Abodunrin and S.S. Oluyamo (Pages 337-346)
46. Comparative Analysis of Approximation Rules for Computing the Caputo Fractional Derivatives of Functions by Terhemen Aboiyar and Sunday Simon Isah (Pages 347-362)
47. Exact and Approximate Solutions of Some Potential Energy Functions for Diatomic Molecules by Olufadi, Y., Salami I., Yahya W. A., Adelani, M (Pages 363-378)
48. Statistical Analysis of Natural Radionuclides Obtained From Sediments in Ogun River, Nigeria by I.C Okeyode, N.N Jibiri, A.O Mustapha, V. Makinde and F.G Akinboro (Pages 379-390)
49. Application of Multi-Set to log linear models for arbitrary d-Dimensional Contingency Table and its Associated Closed-Form Formula for Maximum Likelihood Estimations by O.C. Okoli, N. A. Nsiegbé and E.I Ezenekwe (Pages 391-398)
50. Construction of Arithmetic Probability Distribution on A Defined Interval $[a, b]$ by O.C. Okoli , N.A. Nsiegbé and D.F. Nwosu (Pages 399-402)
51. On the Combinatorics of Finite Dimensional Multi-Set and its Associated Probability Mass Function by O.C Okoli, N. A. Nsiegbé and R. N Ujumadu (Pages 403-408)
52. Application of Geometric Programming in Modelling of Solid Waste Products (Refuse): A Contribution In Combating Pollution, Uncontrolled Spending And Climate Change by Harrison O. Amuji and Ngozi C. Umelo-Ibemere (Pages 409-412)
53. Comparison of the Reliability of Dry Cell Batteries by Harrison O. Amuji and Ngozi C. Umelo-Ibemere (Pages 413-418)
54. A Study of Injectivity Decline of Wells in a Reservoir Intersected By a Fluid Injector by Odeh I.O. , Giegbefumwen P.U. and Adewole E.S (Pages 419-428)
55. Sensitivity Analysis in a Manpower Planning Model by S.A. Ogumeyo and P.O. Ekoko (Pages 429-440)
56. Application of Euler Method (EM) for the Solution of Some First Order Differential Equations With Initial Value Problems (IVP's) by D.I Lanlege, U. M. Garba, U. M. Gana and M.O. Adetutu (Pages 441-450)
57. On The Solution of Riccati Equation Using Laplace Transform Decomposition Algorithm (LTDA) by R.A Mustapha and A.M. Kassim (Pages 451-454)
58. Solution of Riccati Differential Equation with Variable Co-Efficient By Differential Transform Method by R.A Mustapha and G.A Idowu (Pages 455-458)
59. Approximate Method for Solving Fractional Riccati Differential Equation by R.A Mustapha and G.A Idowu (Pages 459-464)
60. Determination of Vibrational Frequencies, Homo-Lumo Energy And IR-Spectra of Nucleobases (Adenine, Cytosine, Guanine, Thymine And Uracil) by A.S Gidado, G. Babaji and M. Ado (Pages 465-476)
61. The Effect of Dust Particles On Instability Due To Electron Beam In Ionospheric Plasma by B. Ekong, A. M. Nura, and Y. I. Yola (Pages 477-484)

62. Erratum:Application of Response Surface Methodology for Optimizing Oil Extraction Yield From Tropical Almond Seed by C. E. Akhabueand G. E. Osamwonyi (Pages 485-492)

1. Coefficient Estimates for New Subclasses of Ma-Minda Bi-starlike Functions

¹*O. A. Fadipe-Joseph*, ²*Y.O. Afolabi* and ³*B. O. Moses*

¹Department of Mathematics, University of Ilorin, P. M. B 1515, Ilorin, Nigeria,

²Department of Mathematics, Sokoto State University, P. M. B. 2134, Sokoto, Nigeria.

³Department of Industrial Mathematics, Landmark University, P. M. B. 1001, Omu Aran, Nigeria.

Abstract

In this paper, we make use of the principle of subordination to define new subclasses of bi-univalent functions, the bounds of the coefficients of functions in these classes are obtained. Furthermore, Fekete-Szego functionals for the new classes involving sigmoid function are given.

Keywords: Bi-starlike function, Subordination, Sigmoid function, Fekete-Szego functional.
AMS Mathematics Subject Classification (2010): 30C45.

2. Analysis of Diffusion Approximation for Queues and Its Application

*S. S. Daodu*¹, *J. N. Ugwu*², *K.C Ukaoha*³ and *O. Folorunsho*⁴

^{1,3}University of Benin, Nigeria.

^{2,4}Federal University, Oye-Ekiti, Nigeria.

Abstract

Diffusion approximation is an improvement to the fluid approximation by permitting $\alpha(t)$ and $\delta(t)$ to have variations about the mean, where $\alpha(t)$ represents the total number of arrivals upto time t and $\delta(t)$ the total number of departures. It is a second-order approximation to queueing systems. In this paper we provide a detailed analysis of the diffusion approximation, and also present some specific examples of the application of the diffusion model.

Keywords: Diffusion, Heavy-Traffic, Birth-Death, Flexible manufacturing Systems, Renewal Process.

3. Application of Multi-Set to loglinear models for arbitrary d -Dimensional Contingency Table and its Associated Closed-Form Formula for Parameter Estimations

O.C. Okoli, N. A. Nsiegbe and M. Laisin

Department of Mathematics, P.M.B 02Uli, Chukwuemeka Odumegwu Ojukwu University,
Anambra State, Nigeria

Abstract

The purpose of this research paper is to give a classical (combinatorial) proof for the closed-form formula that evaluates the parameter estimation for arbitrary d -dimensional Multi-index. Statistically, this can be referred to as d -dimensional contingency table, such that the index (running) variable $\bar{i}_d = i_1 i_2 \dots i_d$ or i_1, i_2, \dots, i_d is not necessarily a point (i), but rather a vector $(\bar{i}_d) = (i_1, i_2, \dots, i_d)$, where $i_r \in [k_r]$, $k_r \in \mathbb{N}$, $r \in [d]$.

Keywords: Permutations, Combinations, Multi-Set, Multi-Index, Probability, contingency table.
Mathematics Subject Classification: 05A10

4. Incorporating Spatial Structures in the Analysis of Two Sets of Experimental Data

Ojurongbe T.A and Bashiru K. A

Department of Mathematical and Physical Sciences, Osun State University,
Osogbo, Osun State, Nigeria.

Abstract

Spatial variability, concerned with variation among observations in space, is usually ignored in the analysis of field experiments. Inclusion of significant random spatial effects enhances the efficiency of estimation of fixed effects. Mixed modelling provides the opportunity to perform such analysis. Two datasets were investigated for the existence of spatial patterns and, where appropriate, the incorporation of such existence in the analysis of the data sets. The study indicated that spatial patterns varied over different datasets and that these patterns could be modelled using appropriate spatial variance and covariance structures. The approach is recommended as a standard practice in the analysis of agronomic and spatial-temporal related trials.

5. Bayesian Minimum Message Length⁸⁷ with Parametric Heteroscedastic Linear Model (pages pp 35 – 44)

Oloyede I.

Department of Statistics, University of Ilorin, Nigeria.

Abstract

A Metropolis-Hasting algorithm was adapted to perform simulation on marginal posterior distribution of heteroscedastic linear model using Minimum Message Length⁸⁷ which was conjugated with normal and inverted gamma priors to derive joint posterior distributions. The asymptotic behaviour was compared using absolute bias and mean square error criteria in order to ascertain consistency and efficiency of the estimator. The estimator is both asymptotically consistent and efficient. Results from this study would assist social and behavioural scientists if the methodology is adopted when presence of heteroscedasticity is established. This will enable them to have good precision of the inferences of the models parameters estimate. The estimator performed better when compare with conventional ordinary least square estimator. The algorithm runs faster in computation.

Keywords: Bayesian Inference, MML⁸⁷, BMML⁸⁷, Heteroscedastic, MCMC.
JEL: C52 & JEL C11.

**6. Analysis of One-Dimensional Abrasive Wear Rate in Hot Forging Process
(Pages 45 – 56)**

C.I. Oviawe¹ and J.A. Akpobi²

¹Department of Mechanical Engineering, Edo State Institute of Technology and Management, Usen, P.M.B. 1104, Benin City, Edo State.

²Department of Production Engineering, University of Benin, P.M.B 1154, Benin City.

Abstract

The analysis of one-dimensional abrasive wear rate in hot-forging process was computed using the Bubnov-Galerkin Finite Element Method in the present study. The weak form of the governing differential equation was obtained and nodal contact pressures for linear interpolation functions for different elements are calculated for Neumann boundary conditions. Time approximation was done with the aid of the Crank-Nicholson Finite difference scheme and time step ($\Delta t = 0.5$) was used to obtain

equation for the solution. Using a numerical example the results showed a maximum error of 0.5 percent for a number of linear elements. It is concluded that as the mesh is refined further progressively, the finite element solution approaches the exact solution which is an indication that the solutions are accurate and the method is robust.

Keywords: Finite element method, Crank-Nicholson, Finite difference scheme, Bubnov-Galerkin, Time approximate.

7. Comparison of Numerical Algorithms for Solving Non-Linear Equations (Pages 57 – 60)

Abdullahi Salisu

**Department of Computer Science, Niger State Polytechnic, Zungeru,
Niger State, Nigeria.**

Abstract

There are no any general formulas for solving or finding the roots of Polynomial equations of higher degrees (higher than 4). Some polynomial equations can be solvable in some straight forward manner but most polynomials (in real life) aren't solvable. Instead we find the numerical approximation to some degree of accuracy. In this paper, we propose some new computational algorithms from the existing classical methods. The proposed method has been illustrated with some Numerical examples. The Numerical results obtained indicate that the new computational algorithms provide the good performance of iterations by reducing the number of iterations when compared with the Classical methods.

1. **Keywords:** Bisection Method, Regular Falsi Method, Nonlinear Equation, Numerical Examples
-

8. An Alternative Solid Waste Management System in Nigeria: A Case for Local Production of Solid Waste Derived Fuel (SWDF) - (pages) 61 – 70

H.J. Itoje, E.P. Akhator, N Enoma and G.A. Ojariafe

Department of Mechanical Engineering, University of Benin, Edo State, Nigeria.

Abstract

The problem of waste management is continuously on the increase on a daily basis in Nigeria. Despite the huge clamour for

and the importance of proper waste management, the local government authorities and waste managers appear to be unequal to the task of waste management evidenced from the increasing quantity of solid waste constantly decorating street corners, road sides and road medians in the country. Will there ever be a solution to the menace of waste management in Nigeria? This study attempts to profer an alternative approach to waste management in Nigeria through the production and utilization of Solid Waste Derived Fuel (SWDF). It was discovered that about 51.74% of the solid waste stream in Nigeria can be processed to produce SWDF, thereby reducing drastically the volume of solid waste left to be disposed. With an experimentally determined calorific value of 16.81MJ/kg, the produced SWDF can be used as supplementary fuel for cement industries and power generation companies in Nigeria.

Keywords: Solid waste management, Solid Waste Derived Fuel, Calorific Value, Moisture Content.

9. *Journal of the Nigerian Association of Mathematical Physics*
Volume 31, (July, 2015), pp 71 – 78
© J. of NAMP

The Effect of Sputtering Parameters on the Hardness and Fracture Toughness of Copper Oxide Thin Films Prepared by Reactive Magnetron Sputtering

T.H. Darma

Department of Physics, Bayero University, Kano, P.M.B. 3011, Kano-Nigeria.

Abstract

The effects of deposition parameters on some mechanical properties of copper oxide thin films are investigated. A Hysitron Tribo-Nanomechanical system and a Shimadzu Micro Hardness tester with a diamond Vickers indenter were used to perform Nanoindentations and Micro indentations at various loads on copper oxide thin films prepared on glass slides at various deposition conditions. The films are found to be predominantly of the cuprous oxide (Cu₂O) phase. The mechanical properties evaluated comprises of hardness found to be in the range of 4.13 – 4.99 GPa, elastic modulus of 52.24 – 66.69 GPa, plasticity index of 0.061 – 0.079, and fracture toughness of $0.64 \pm 0.26 - 1.55 \pm 0.49 \text{ MPa.m}^{1/2}$. The findings are indications that copper oxide thin films exhibit fracture brittle in nature.

Keywords: Reactive magnetron sputtering, copper oxide, fracture toughness

10. *Journal of the Nigerian Association of Mathematical Physics*
Volume 31, (July, 2015), pp 79 – 82
© J. of NAMP

A Survey of the Mathematical Equations of Coronal Mass Ejections (CMEs)

Said R.S, Okoli N. A. and Ekwubiri E.C

Department of Physics, Bayero University, Kano.

Abstract

Coronal Mass Ejections (CMEs) are transient events in which large amounts of plasma are ejected from the solar corona. Coronal mass ejections release huge quantities of electromagnetic radiations into space above the Sun's surface, either near the corona or farther into the planet system. The ejected material is plasma consisting primarily of electrons and protons but may contain small quantities of heavier element such as helium, oxygen and even iron. It is associated with enormous changes and disturbances in the coronal magnetic field. The usual method of observations of Coronal Mass Ejections (CMEs) is in visible light using coronagraphs. Since CMEs are composed primarily of plasma, they therefore contain large amount of free electrons and the light observed are scattered and bounce off these electrons through the Thomson Scattering Process (TSP). In this paper, the dynamics of Coronal Mass Ejections (CMEs) are surveyed through the Thomson Scattering theory by presenting the mathematical equations governing the observation of this phenomenon.

Keywords: Coronal Mass Ejections (CMEs), Thomson Scattering, Plasma, Solar Corona.

*11. Journal of the Nigerian Association of Mathematical Physics
Volume 31, (July, 2015), pp 83 – 94
© J. of NAMP*

Electronic Structure and Properties of 2Hydroxyanthracene in Gas Phase and in Ethanol: RHF and DFT Study

Umar Gurku¹ and Chifu E. Ndikilar²

¹Physics Department, Nasarawa State University, Keffi, Nigeria

²Physics Department, Federal University Dutse, P.M.B 7156, Dutse, Jigawa State, Nigeria.

Abstract

In this article, the molecular dynamics of the organic semi-conductor material 2-hydroxyanthracene in gas phase and in ethanol is examined using ab initio Quantum Chemical calculations at the Restricted-HartreeFock (RHF) level of theory by employing 6-31G basis set and Density Functional Theory (DFT) using the same basis set for inclusion of electron correlation. The molecular structure, dipole moment, quadrupole moment, charge transfer, polarizability, energy and vibrational frequencies with Infrared (IR) and Raman intensities have been studied. The change in polarizability tensors is found to be more pronounced in solution than in the gas phase.

*12. Journal of the Nigerian Association of Mathematical Physics
Volume 31, (July, 2015), pp 95 – 100
© J. of NAMP*

Taxonomy of P2P Networks and their Associated QoS Parameters

¹Adamu Aminu and ²Ahmed Jamilu Bashir

**Umaru Musa Yar'adua University, Katsina. P.M.B 2218, Katsina State, Nigeria.
Mathematics and Computer Science Department.**

Abstract

Presently, many networks provide real time and on-demand services to users over the Internet. Initially client/server model was used for rendering these services. Due to scalability constraint of the client/server model among other reasons, many networks have now adopted Peer-to-Peer model (P2P model). In P2P model, each user is simultaneously a consumer and a provider of services, as such, more users means better performance. The paper describes the general architecture of P2P systems in detail. It further classified P2P networks based on Location-awareness, Overlay construction and Service delivery. Each class was comprehensively explained and examples for each class were provided. We further identified and explicitly defined the Quality of Service (QoS) parameters for P2P networks. The paper however, highlights the need to channel more effort on how to improve the identified QoS parameters in the paper, especially those that directly influence users' experience.

Keywords: P2P Systems, QoS Parameters, Location Awareness, Overlay Construction, Service Delivery.

13.

*Journal of the Nigerian Association of Mathematical Physics
Volume 31, (July, 2015), pp 101 – 106
© J. of NAMP*

Credit Card Fraud Detection Using Firefly Algorithm

Olusegun Folorunso

**Department of Computer Science, Federal University of Agriculture, Abeokuta,
Ogun State, Nigeria.**

Abstract

In this study, a Firefly Algorithm (FA) based Credit Card Fraud Detection (CCFD) for e-payment system is presented. This takes into consideration, discrete optimization problem associated with

arbitrary changes in the state of credit card holder's behaviour variables that occur as payment transactions progresses. However, the existing CCFD techniques always lead to false fraud alerts and eventual misclassification of transaction decisions. Genetic Algorithm (GA), a bio-inspired algorithm and other computational intelligence techniques have been used earlier for CCFD. From literature, it has proven that FA is superior to GA because of its efficient global search strength. Hence, FA, a meta-heuristic algorithm is proposed in this study and to the best of our knowledge, FA has never been used in detecting credit card fraud. Meanwhile, FA takes inputs from account details of credit cards and fraud rules set to classify frauds based on Critical Value Identification (CVI) for each credit card. CVI determines light intensity and minimum attractiveness (brightest firefly) used to develop the FA objective function needed to minimize false fraud alert being experienced in CCFD system.

Keywords: Fraud detection system, electronic payment system, credit card, firefly algorithm, critical value identification.

14.

Journal of the Nigerian Association of Mathematical Physics
Volume 31, (July, 2015), pp 107 – 114
© J. of NAMP

A Genetic Algorithm for Optimization of Trust- Based Knowledge Sharing Adoption Model

Olusegun Folorunso

**Department of Computer Science, Federal University of Agriculture, Abeokuta,
Ogun State, Nigeria.**

Abstract

The degree of willingness or intention to share knowledge based on trust, varies among the trustees in various organizations. However, the relationship between the knowledge sharing trust variables and the determination of optimal trust variable that contributed most in knowledge sharing (KS) has not been well researched. Meanwhile, Trust- Based Knowledge Sharing Adoption Model (TBKSAM) was developed using Technology Adoption Model to determine the needed KS trust variables. In this study, Genetic Algorithms (GA) was used to determine the optimal trust variable in KS system. However, in order to establish the relationship between the KS trust variables, multiple regression model was derived which later became fitness function for GA model. Also, the TBKSAM which shows the extent KS trust variables correspond accurately to each other was validated at 95% confidence interval. Furthermore, the degree of association between KS trust variables has been found with almost significant interaction. The optimum KS trust variables combination to the attainment of Knowledge Sharing Trust Level (KSTL) goal was implemented using MATLAB gaobj solver. A sensitivity analysis using multiple regression model and the effect of change in weight to the fitness function in aggregation method was

compared to the optimal solution. It was found that the optimal solution is more stable and performed better for the combination of KS trust variables adopted in KSTL.

Keywords: Multiple regression, Genetic Algorithms, trust variables, knowledge sharing, technology adoption model.

15.

Journal of the Nigerian Association of Mathematical Physics
Volume 31, (July, 2015), pp 115 – 122
© J. of NAMP

Stochastic Analysis of Heterosexual Transmission of HIV/AIDS Epidemic in The Presence of Treatment

Bashiru K.A¹ and Ojuronbe T.A²

Osun State University, Department of Mathematical Sciences, P.M.B 4494, Osogbo, Nigeria.

Abstract

HIV/AIDS epidemic proves to be a deadly disease until recently when the treatment is being introduced. This paper addresses the scope of HIV/AIDS with respect to Heterosexual mode of transmission extensively with the introduction of treatment. The model was developed by solving the Chapman - Kolmogorov differential equation using birth – death process. Solving the model using probability Generating Functions (PGF) approach, the expectations and variance of probability distribution resulting from the model were obtained for Susceptible (S) persons, Infected (I) persons, Treatment (T) and AIDS (A) cases. Sensitivity analysis was carried out to investigate the influence of key parameters of the model on the spread of the disease.

Keywords: Probability Generating Function, HIV Transmission, Stochastic compartmental model, Heterosexual Transmission and Treatment.

16.

Journal of the Nigerian Association of Mathematical Physics
Volume 31, (July, 2015), pp 123 – 128
© J. of NAMP

Fuzzy Logic Diagnostic System for Disease Detection

¹Daodu S. S., ²Ukaoha K. C., ³James T. R. and ⁴Amadin I. F.

^{1,2,4}Department of Computer Science, University of Benin, Benin City, Nigeria
³Department of Computer Science, College of Education, Igueben, Edo State, Nigeria.

Abstract

A major problem in medical diagnosis is precision and accuracy. The traditional medical diagnosis method is characterized with the aforementioned problem. The advent of computers has led to the development of several algorithms and technologies to ensure accuracy and precision. One such technology is fuzzy logic- an integral part of Artificial Intelligence. In this work, we proposed a medical diagnostic system using fuzzy logic which would enhance the accuracy and precision of the entire system. The focus of the work is on malaria diagnosis and the system was developed using Visual Prolog Programming Language.

Keywords: Fuzzy Logic, Expert System, Medical diagnosis, Artificial Intelligence, Soft Computing.

17.

Journal of the Nigerian Association of Mathematical Physics
Volume 31, (July, 2015), pp 129 – 136
© J. of NAMP

Development of a Water-Based Drilling Fluid for Shale Reservoirs with Emede Clay

P.N. Onwuachi-Iheagwara

**Department of Petroleum and Gas Engineering, Delta State University, Abraka,
Oleh campus, Oleh, Nigeria.**

Abstract

This paper documents the design of a drilling fluid using Emede clay (south Nigeria) customized for shale reservoirs. Preliminary investigation suggests that Emede clay has a good potential for use in drilling operations when beneficated appropriately.

Keywords: Nigerian shale, Emede clay, drilling mud.

18.

Journal of the Nigerian Association of Mathematical Physics
Volume 31, (July, 2015), pp 137 – 146
© J. of NAMP

**Evaluation of Groundwater Potential Using Electrical Resistivity Method in Awo-
Osun Community, Ile-Ife, Southwestern, Nigeria**

¹Samuel Omosule Sedara and ²Olusegun Olalekan Alabi

**¹Department of Physics and Electronics, Adekunle Ajasin University,
Akungba, Ondo State, Nigeria.**

²Department of Physics, Osun State University, Osogbo, Osun State, Nigeria.

Abstract

Electrical Resistivity investigation was carried out in order to provide information on the subsurface layers and characterization of the overburden units to groundwater around a land fill in Awo-Osun, a community in Ile-Ife. The qualitative interpretation of the results identified areas of hydro-geologic importance and form basis for Vertical Electrical Sounding (VES) investigation. Thirteen (13) Vertical Electrical soundings (VES) were carried out across the area using the Schlumberger electrode array configuration, with half-current electrode separation (AB/2) varying from 1m to 100m. The Schlumberger configuration was used to delineate the subsurface geology of the study area. This configuration was used due to the fact that it is more suitable for depth sounding than the other configurations. In the survey, data were collected from thirteen (13) VES Stations located at different parts of the town. Partial curve matching with aid of maser curve and a computer as sited program were employed to obtain the various layer resistivities, thickness and depths. The sub-surface layer parameters obtained from partial curve matching served as start off point for the computer model program. Results show that the sub-surface of the study area consists of three, four and five layered structures. The ranges of resistivity of the layers are: for the first layer 16.5-1042.5 Ω m, second layer 18.8-1560.4 Ω m, and third layer 8.6-9868.5 Ω m. The fourth layer constitute the groundwater aquifer which was determined to be confined by the third ubiquitous layer constituted by clays with thickness varying from 3.8 – 17.7 m and sandy clay/clayey sand of about 14.6 – 22.3m thick.

On the basis of geoelectric parameters (longitudinal conductance), the study area is zoned into good ($s > 0.5$), intermediate ($s < 0.4$) and poor ($s < 0.1$) groundwater potential zones.

Keywords: Groundwater, electrical resistivity, conductance, subsurface layer.

19.

Journal of the Nigerian Association of Mathematical Physics

Volume 31, (July, 2015), pp 147 – 160

© J. of NAMP

Thermodynamic Properties Prediction of the Bulk Modulus Of Sediment-Hosted Disseminated Gold Deposits

¹A.A. Adetoyinbo and ²A.K. Bello

¹Department of Physics, University of Ibadan, Ibadan, Nigeria

²Department of Physical Sciences, Bells University of Technology, Ota, Nigeria

Abstract

An equation of state that connects pressure, volume, and temperature are very important in studying the temperature dependence of the thermal bulk modulus. Pressure, and temperature also determines the state of matter at different depths, different geological environments. A lot of work has been carried out on gold which includes: the determination of the Critical point of gold, geochemistry of gold, the role of organic matter and source of gold

in sediment-hosted disseminated gold mineralization using Rock-Eva Analysis. Temperature effects on the universal equation of state of solids among others. Hence, this work aimed at the investigation of high temperature thermodynamic properties prediction of the bulk modulus of sediment-hosted disseminated gold using model with experimental data. Analysis was carried out with pressure vessel, analysis of both pressure and temperature effects on bulk modulus of gold can be use to predict the future state of gold deposits.

Keywords: Thermal analyses, high pressure, high temperature, compressed volume, disseminated gold

20.

Journal of the Nigerian Association of Mathematical Physics
Volume 31, (July, 2015), pp 161 – 166
© J. of NAMP

Measurement of Natural Radioactivity levels in the Topsoil of Abandoned Tantalite Mine in Southwestern, Nigeria

¹Olowookere C. J., ¹Adeoje E.A., ²Jibiri N.N. and ³Igboama W.N.

¹Department of Physical Sciences, Ajayi Crowther University, Oyo Town
²Health Physics Research Laboratory, Department of Physics, University of Ibadan
³Department of Physics, Federal Polytechnics, Ede, Osun State.

Abstract

Activity concentration of naturally occurring radionuclides in the topsoil of an abandoned tantalite mine at Awo in Osun State was measured using gamma ray spectrometry method. The results indicate that activity concentration of ²³⁸U, ²³²Th and ⁴⁰K vary from 36.91 ± 3.44 to 517.21 ± 30.24 Bq kg⁻¹, 92.12 ± 21.06 to 261.61 ± 52.88 Bq kg⁻¹, and 1001.06 ± 6.88 to 1902.25 ± 11.07 Bq kg⁻¹ respectively. The mean activity concentration of radionuclide: ²³⁸U, ²³²Th and ⁴⁰K are 282.86 ±17.44, 164.29 ±34.73 and 1391.99 ±8.78 respectively. The mean radium equivalent activity concentration, Ra_{eq} obtained in this study is 618.33 Bq kg⁻¹. This is higher than the recommended reference value of 370 Bq kg⁻¹ for safe use. Moreover, the mean external (H_{ex}) and internal (H_{in}) health hazard indices are greater than unity, indicating that intervention is necessary in the present study location. The result of the average total external gamma dose rate (288.24 nGy h⁻¹) is higher than Indian average value (90 nGy h⁻¹) and the world average (86 nGy h⁻¹). The results of this study show that the soil of the study area contains a relatively higher activity concentration above the recommended reference value and could be considered unsafe for building construction.

Keywords: Natural radioactivity, activity concentration, radium equivalent activity, health hazard index, tantalite mine.

Effect of High Temperature on the Residual Strength Properties of Concrete

R. I. Umasabor and O.E. Alutu

Civil Engineering Department, University of Benin

Abstract

The purpose of this work is to determine the effect of high temperature on the residual strength properties of concrete. The cement used for this work was Ordinary Portland cement of grade 42.5 meeting the requirement of type 1 cement. The fine aggregate and coarse aggregate used to produce concrete were all obtained from Benin City, Edo state, Nigeria. Sieve analysis was carried out for the fine aggregate. Water/cement ratio of 0.55 were used to produce a total of 84 samples of 100mm x 100mm concrete cubes for grade 30 (C30) concrete design mix. The samples were exposed to high temperatures of 300⁰C to 800⁰C for one (1) hour in a muffle electric furnace. The results obtained at 28days for 23⁰C, 300⁰C, 400⁰C, 500⁰ C, 700⁰C and 800⁰C are 38.2N/mm², 35.0N/mm², 32.9N/mm², 30.9N/mm², 24.7N/mm², 17.2N/mm² and 10.6N/mm² respectively. The percentage reduction of the compressive strength from 23⁰C to 800⁰C is 27.7%. These depict that concrete compressive strength reduces to 27.7% when exposed to high temperature of 800⁰C for one hour.

Effect of Cement Grades on some Strength Properties of Concrete

R. I. Umasabor and O.E. Alutu

Civil Engineering Department, University of Benin

Abstract

The purpose of this study is to investigate the effects of cement grades on some strength properties of concrete in Nigeria. Thirty samples of 100mmx100mm concrete cubes were cast with grade 32.5 and 42.5 cement (elephant brand) and cured for 3, 7, 14, 21, and 28days with a design mix of grade 20 (C20). Also twenty four samples of 100mmx100mmx600mm concrete beams were cast and cured for 7, 14, 21, and 28days with a design mix of grade 25 (C25) respectively. The compressive strength test results obtained for the grade 32.5 cement at 3, 7, 14, 21, and 28 days curing period were 7.17N/mm², 14.33N/mm², 18.0N/mm², 20.33N/mm² and 21.0 N/mm² respectively. Similarly, the compressive strength results for grade 42.5 cement results at 3, 7, 14, 21, and 28 days curing period were 7.33N/mm², 14.33N/mm², 19.33N/mm², 22.83N/mm² and 23.0N/mm²

respectively. Both cement grades meet grade 20(C20) concrete requirements design mix. Furthermore, the flexural strength test results of concrete beams made with 42.5 cement grade includes 0.10N/mm^2 , 0.11N/mm^2 , and 0.14N/mm^2 , 0.19N/mm^2 respectively at 7, 14, 21 and 28days respectively. While the flexural strength test results of concrete beams made with grade 32.5 cement includes 0.07N/mm^2 , 0.08N/mm^2 , 0.09N/mm^2 and 0.10N/mm^2 at 7, 14, 21, and 28 days. The difference between the flexural strength of 32.5 and 42.5 cement grades were not enormous. This study has revealed that cement grades does not translate to concrete strength.

23. Volume 31, (July, 2015), pp 179 – 184
© J. of NAMP

Fullerene Production from Pyrolysis of Chlorodifluoromethane

A. U. Agobi¹ and A.J. Ekpunobi²

Department of Physics and Industrial Physics, Nnamdi Azikiwe University Awka.

Abstract

The formation of fullerenes and amorphous carbon from flame combustion (pyrolysis) of chlorodifluoromethane (CH_2ClF_2) was found to involve different systems of carbon clusters called fullerene intermediates. The correlation provides insight into the formation of fullerenes and other carbon clusters. Gas chromatograph mass spectrometer (GCMS) was employed for the separation and characterization of the reaction products, comprising C_{60} and other carbon clusters which molecular formula were determined from their special isotopic patterns. UV-spectrophotometer and Fourier transform infrared (FTIR) spectrophotometer revealed a strong absorption peak at wavelength range of 250nm-300nm.

Keywords: pyrolysis method of plasma; fullerene; chlorodifluoromethane.

24. Volume 31, (July, 2015), pp 185 – 190
© J. of NAMP

Production, Characterization and Prospect Applications of Coal Nanoparticles

A. U. Agobi¹ and A.J. Ekpunobi²

Department of Physics and Industrial Physics, Nnamdi Azikiwe University Awka.

Abstract

Coal ash is a waste material produced by combustion of coal in a thermal power station, In this paper, an attempt has been made to modify the micro sized coal ash into nano structured coal ash using High Energy Ball Milling. The smooth, glassy and an inert surface of the coal ash can be altered to a rough and more reactive state by this technique. Ball milling was carried out for the total duration of 30hrs. The sample was taken out after every 10 hours of milling for

characterizing. The nanostructure coal ash was characterized for its crystallite size, using X-Ray diffractometer. It was found that after 30 hrs of milling, percentage crystallite size of quartz phase present in the coal ash was reduced from 63% to 37% for fresh coal ash and 30hr ball milled powder respectively, thus increasing the amorphous domains in it. The size, shape and texture of the fresh as well as nano structured coal ash were studied using Scanning Electron Microscopy (SEM). The fresh coal ash particles were found to be spherical in shape, while the shape of the 30hrs milled particles was found to be irregular and the surface morphology was also rough.

Keywords: Coal Ash; High Energy Ball milling; Nanomaterial; carbon nanoparticles; XRD- analysis; Electron Microscopy.

25. *Volume 31, (July, 2015), pp 191 – 194*
© J. of NAMP

Preliminary Design of a Small Scale Integrated System for Palm Oil Extraction

O. Osaze, N. Enoma and C. Kwasi-Effah

Department of Mechanical Engineering, University of Benin, P.M.B 1154, Benin City, Nigeria.

Abstract

Small-scale agro-processing firms largely contribute to the production of palm oil in Nigeria. However, the traditional or manual method of palm oil extraction used by these firms has resulted in low sales and product stock in the agricultural market. As part to address these issues, it is imperative to pay attention to the sustainability and local technology improvement of this small scale agro processing firms. In this paper, a low cost integrated system for palm oil extraction was designed, fabricated and tested using locally sourced materials. Analyses was carried out on 5.2 kg of pre-boiled palm fruits and the result showed a time savings of 12 minutes when compared to the traditional method of palm oil extraction process.

Keywords: Palm oil, agro processing firms, extraction, design, product.

26. *Volume 31, (July, 2015), pp 195 – 200*
© J. of NAMP

Modelling Energy Effects During Ethanol Fermentation Coupled with *in situ* Gas Stripping

Amenaghawon N.A, Osazuwa U.O. and Osayuki-Aguebor W.

Department of Chemical Engineering, Faculty of Engineering, University of Benin, PMB 1154, Benin City, Nigeria.

Abstract

The growth of microbial cells during conventional batch ethanol fermentation is inhibited by high concentrations of ethanol. This problem could be alleviated by continuous removal of ethanol from the broth during fermentation and this could increase productivity and potentially reduce the cost of ethanol recovery. Energy effects during batch ethanol fermentation coupled with in situ gas stripping was investigated in this study using a mathematical model. The model which was formulated from energy balance equations was simulated to investigate the effect of gas stripping on some energy variables during fermentation. Results obtained showed that some degree of cooling was introduced by the stripping gas. However, the maximum temperature reduction was 3.5% which did not result in a significant degree of cooling. The amount of metabolic heat generated as well as the heat lost via aeration was observed to increase with increase in stripping gas flow rate. These observations were attributed to the alleviation of product inhibition during fermentation. The energy required for gas compression was observed to also increase with respect to the stripping gas flow rate.

Keywords: Modelling, Bioethanol, Fermentation, *Geobacillusthermoglucosidasius*, Gas stripping.

27. *Volume 31, (July, 2015), pp 201 – 206*
© *J. of NAMP*

Modelling Continuous Ethanol Fermentation: Effect of Dilution Rate and Optimisation of Substrate Consumption

Amenaghawon N.A, Osazuwa U.O. and Osayuki-Aguebor W.

**Department of Chemical Engineering, Faculty of Engineering, University of Benin,
PMB 1154, Benin City, Nigeria.**

Abstract

In this study, continuous ethanol fermentation coupled with in situ gas stripping was analysed using a fermentation model. The growth of cells was simulated using the Hinshelwood specific growth rate model while the production of ethanol was simulated using the Luedeking-Piret production model. The model was simulated to investigate the effect of dilution rate on the fermentation process and substrate consumption was then optimised. Results obtained showed that the fermentation process was favoured by low dilution rates as evident in the increase in the amount of ethanol produced, growth of microbial cells and substrate utilisation. Optimisation of the continuous fermentation process resulted in a substrate utilisation rate of 97% when a dilution rate of 0.01 1/h and a stripping gas flow rate of 68.34 L/h was used.

Keywords: Modelling, Bioethanol, Fermentation, Luedeking-Piret model, *Geobacillusthermoglucosidasius*, Gas stripping.

28. *Volume 31, (July, 2015), pp 207 – 212*
© *J. of NAMP*

Measuring the Value of ICT in the Nigerian Service Industry

Victor A. Olutayo¹ and Godspower O. Ekuobase²

¹Department of Computer Science, Joseph Ayo Babalola University, Osun State, Nigeria.

²Department of Computer Science, University of Benin, Benin City, Nigeria.

Abstract

A key challenge within the service industry is how the benefits from ICT adoption and diffusion (ICT value) relate to the degree of adoption and diffusion of ICT (ICT maturity). This has resulted in the uncertainty of value generation from investments on ICT leading to ICT mis-planning and disaster. For sustainable improvement of ICT based service delivery in Nigeria therefore, the ICT value index of the Nigerian service industry has to be measured. The value of ICT to selected service firms listed in the Nigerian Stock Exchange (NSE) has been measured using the Value Added Intellectual Coefficient (VAIC) model. The result showed that the Nigerian service industry's ICT value index is 4.60, an indication that the potentials of ICT are poorly utilized for service delivery in the Nigerian service industry.

Keywords: Service industry, Nigeria, VAIC, and ICT value index.

29. Volume 31, (July, 2015), pp 213 – 222

© J. of NAMP

Measuring ICT Maturity of Nigerian Service Firms Using ICT Maturity Model of SMEs and the Analytical Hierarchical Process Model

Godspower O. Ekuobase¹ and Victor A. Olutayo²

¹Department of Computer Science, University of Benin, Benin City, Nigeria.

²Department of Computer Science, Joseph Ayo Babalola University, Osun State, Nigeria.

Abstract

A key challenge within the service industry is how the benefits from ICT adoption and diffusion (ICT value) relate to the degree of adoption and diffusion of ICT (ICT maturity). This has resulted in the uncertainty of value generation from investments on ICT leading to ICT mis-planning and disaster. For sustainable improvement of ICT based service delivery in Nigeria therefore, the ICT maturity index of the Nigerian service industry has to be measured. The ICT maturity of selected service firms listed in the Nigerian Stock Exchange (NSE) has been measured adapting the ICT Maturity model of Small-and-Medium Enterprises (SMEs) by using the Analytical Hierarchical Process (AHP) model was used to determine the weights of the four main factors that constitute the ICT maturity model against the original equal weighting of the factors. The results showed that the Nigerian service industry is web based in ICT maturity with an index of about 0.78, an implication

that ICT penetration and usage in the Nigerian service industry has reached an advanced stage.

Keywords: Service industry, Nigeria, ICT maturity, ICT maturity model and AHP.

30. *Volume 31, (July, 2015), pp 223 – 230*
© J. of NAMP

Modelling Permeability with Porosity and Grain Size Diameter

Alabi O.O.¹ and Olayiwola M.O.²

¹**Solid Earth Physics Research Laboratory, Faculty of Basic and Applied Sciences, College of Science, Engineering and Technology, Osun State University, Osogbo, Nigeria.**

²**Computational Mathematics Research Group, Faculty of Basic and Applied Sciences, College of Science, Engineering and Technology, Osun State University, Osogbo, Nigeria.**

Abstract

Sand sample of different porosities from riverbed were used as porous media. A modeled experiment was set up to determine the volume of water flowing across a unit cross sectional area per unit time in these saturated sand samples packed in a vertical transparent cylindrical tube of radius $1.85 \times 10^{-2} \text{m}$. Values of volume flux rate were determined for hydraulic gradient between 1.875 and 30.000 by using vertical flow form of Darcy's equation. The plot of hydraulic conductivity (K) against porosity ϕ and that of permeability (k) against porosity ϕ give relation $K = 0.0342e^{10.113\phi}$ ($R^2 = 0.925$) and $k = 0.0351e^{10.122\phi}$ ($R^2 = 0.925$) respectively. While the plot of hydraulic conductivity (K) against grain size diameter (d_s) and permeability (k) against grain size diameter (d_s) give relation $K = 0.395e^{0.049d_s}$ ($R^2 = 0.96$) and $k = 0.4027e^{0.0049d_s}$ ($R^2 = 0.96$) respectively. From the K - ϕ , k - ϕ , K - d_s and k - d_s curves, it shows that there is a strong correlation between grain size and hydraulic conductivity vis-à-vis permeability relatively to porosity and that irrespective of the grain size diameter or porosity, the value of permeability and hydraulic conductivity can never be zero.

Keywords: Volume flux rate, porous media, permeability, porosity, hydraulic gradient.

31. *Volume 31, (July, 2015), pp 231 – 240*
© J. of NAMP

Variation of Natural Gamma Radiation with Vertical Height

Idris Ahmad, Y.Y. Ibrahim, Ibrahim Abdullahi

Physics Department, Bayero University, Kano, P.M.B.3011.

Abstract

This paper presents the results of variations of the natural gamma radiation with vertical height. An experiment was conducted to investigate the effect of changes in vertical height on the gamma

radiation absorbed dose level in the environment and its implication on Radiation hazards. The gamma radiation absorbed dose level measurements were carried out within four weeks using a Geiger-Muller(G-M) tube, the result shows that gamma radiation absorbed dose in the environment reduces with increase in vertical height.

Keywords: Gamma radiation, absorbed dose, Geiger-Muller tube (GMT).

32. *Volume 31, (July, 2015), pp 241 – 250*

© *J. of NAMP*

EOQ Model for Deteriorating Items that Exhibit Delay in Deterioration with Discrete Time

¹Yakubu M.I. and ²Sani B.

Department of Mathematics, Ahmadu Bello University, Zaria-Nigeria.

Abstract

In this paper, we developed an Economic Order Quantity (EOQ) inventory model for delayed deteriorating items with discrete time and constant decay rate of on-hand inventory. The model was used to determine an optimum ordering quantity and replenishment cycle. The demand before deterioration is different from the demand after deterioration has set in which are both constant. Some numerical examples were given to illustrate the application of the model.

33. *Volume 31, (July, 2015), pp 241 – 250*

© *J. of NAMP*

EOQ Model for Deteriorating Items that Exhibit Delay in Deterioration with Discrete Time

¹Yakubu M.I. and ²Sani B.

Department of Mathematics, Ahmadu Bello University, Zaria-Nigeria.

Abstract

In this paper, we developed an Economic Order Quantity (EOQ) inventory model for delayed deteriorating items with discrete time and constant decay rate of on-hand inventory. The model was used to determine an optimum ordering quantity and replenishment cycle. The demand before deterioration is different from the demand after deterioration has set in which are both constant. Some numerical examples were given to illustrate the application of the model.

34. *Volume 31, (July, 2015), pp 255 – 262*

© *J. of NAMP*

On Application of Differential Transform Method: A Modified Approach to Solution of Certain KdV Equations

M. I. Modebet¹, I. Otaide², O.O. Olaiya³, E. J. Ejiofor⁴

^{1,3,4}Department of Mathematics Programme, National Mathematical Centre, Abuja, Nigeria.

²Department of Mathematics, Delta State University, Abraka.

Abstract

In mathematics, the Korteweg–de Vries equation (KdV equation for short) is a mathematical model of waves on shallow water surfaces. It is particularly notable as the prototypical example of an exactly solvable model, that is, a non-linear partial differential equation whose solutions can be exactly and precisely specified. In this paper, we proposed the method of differential transform with a modified approach using the wave variable to obtain analytic solution of the KdV equation. This method helps to reduce minimally the enormous amount of mathematical computation in solving such kind of problem, and thus shows the efficiency of the method.

Keywords: Wave variables, KdV equation, Differential Transform Method (DTM), Tailor series, Differential Equations.

35. *Volume 31, (July, 2015), pp263 – 270*
© J. of NAMP

On Soft Lattice Theory

A.M. Ibrahim¹ and A. O. Yusuf²

¹Department of Mathematics, Ahmadu Bello University, Zaria-Nigeria

²Department of Mathematical Sciences and Information Technology, Federal University, Dutsin-Ma, Katsina, Nigeria.

Abstract

We revisit the term soft lattices and present some of its algebraic properties. Soft set lattice is redefined here in terms of supremum and infimum and some related results are established. The concept of upper bound and least upper bound, lower bound and greatest lower bound were defined in soft set context.

Keywords: Soft set, ordered soft lattice, partial ordered soft set, upper bound of a soft, least upper bound of a soft set, lower bound of a soft set, greatest lower bound of soft set, soft lattice

36. *Volume 31, (July, 2015), pp 271 – 278*
© J. of NAMP

The Exponential Paraletrix

M.O. Oni¹ and A.Aminu²

¹Department of Mathematics, Ahmadu Bello University, Zaria.

²Department of Mathematics Kano University of Science and Technology, Wudil,
P.M.B. 3244, Kano, Nigeria.

Abstract

This paper established the theory of exponential paraletrix using the hearty multiplication of rhotrix and presents results and characteristics of this concept. Unlike exponential matrix, where the matrix is required to be square, exponential paraletrix exist for any type of order, so long that the heart of the paraletrix exists. We extend to show that the set of this exponential paraletrix forms an Abelian group under the hearty multiplication.

Keywords: Paraletrix; exponential paraletrix; convergence; group, hearty multiplication

37. *Volume 31, (July, 2015), pp 279 – 284*
© J. of NAMP

Paraletrix Linear Space

M.O. Oni¹ and A.Aminu²

¹Department of Mathematics, Ahmadu Bello University, Zaria.

²Department of Mathematics Kano University of Science and Technology, Wudil,
P.M.B. 3244, Kano, Nigeria.

Abstract

This paper established the concept of Paraletrix linear Space, an extension of rhotrix vector space to paraletrix and we present the concept of normed space on paraletrix. We extend by showing that the set of paraletrix over two binary operations addition and hearty multiplication of paraletrix forms a field. And state without proof that the norm linear space of paraletrix are Banach space.

38. *Volume 31, (July, 2015), pp 285 – 290*
© J. of NAMP

**Geophysical Determination of Sand Deposits Using
2-Dimensional Electrical Resistivity Imaging in Ologbo Area of Edo State, Nigeria.**

Ezomo F.O., Adagbon J.E. and Abriku E.O.

Department of Physics, University of Benin, Benin City.

Abstract

Subsurface earth's imaging was carried out in Ologbo area of Edo State using Electrical Resistivity method in order to determine deposits of sand. The equipment employed for taking the Electrical resistivity imaging data was the PZ-02(D.C.) Earth Resistivity meter using the Wenner-Schlumberger array with maximum current electrode separation fixed at 100m in the sites investigated. The data obtained were interpreted using ZONDRES2D computer software. The results from the two profile lines investigated in the area, showed sand deposits with probable depth from top ranging between 0.6m – 5.5m and thickness between 2.3m - 4.5m with resistivity varying between 300Ωm -1000Ωm. The interpreted result correlated well with geologic and lithologic data/logs acquired from the survey area.

Keywords: Gamma radiation, absorbed dose, Geiger-Muller tube (GMT).

39. *Volume 31, (July, 2015), pp 291 – 300*
© J. of NAMP

Geophysical Image Investigation of Salt/Brackish Water Intrusion into Freshwater Aquifer in Lagooncoastal Region: A Case Study of University of Lagos, Nigeria.

Olorode D. O.and Ugwoke C.C.

Department of Physics, University of Lagos

Abstract

Groundwater is very essential to humans from all ages. Many factors affect the quality of groundwater aquifer, these include contamination by salt-water intrusion or by toxic industrial/chemical wastes. An assessment of the University of Lagos campus ground water was done using geo-electrical resistivity survey. A total of six electrical imaging lines were traversed with Wennerarray coupled with ten vertical electrical soundings (VES) within the area. The Schlumberger electrode array with current electrode half spacing from 1 to 100m was used to acquire 1D data. For the 2D field surveys, Wenner 64 electrode spread was used, while the spacing between adjacent electrodes ranged from 1.5 to 3.0m. Interpretations include quantitative and qualitative deductions from 1D and 2D geoelectric models. Two software packages were utilized for the analyses in this study: WinResist for 1D plotting and RES2DINV for 2D inversion. The depth of the saline/freshwater interface varied from 6.9 to 64.0m and the thickness of the saline water was greater in the proximity of the coastline. The resistivity inverse model of various positions (1.04-20.0m depth) exposed the zone of brackish/saline water. Two major freshwater aquifers were delineated and they occurred unprotected.

Keywords: Salinity, vertical electrical sounding (VES), 2D profiles, coastal region

40. *Volume 31, (July, 2015), pp 301 – 310*
© J. of NAMP

Performance of a Reservoir Subject to Simultaneous Two-Edged and Bottom Water

Drive Mechanisms.

¹Edo, T. M and ²Adewole E. S.

¹Department of Petroleum Engineering, Edo State Institute of Technology and Management, Usen

²Department of Petroleum Engineering, University of Benin, Benin City

Abstract

The objective of this study is to analyzing the performance of a reservoir subject to simultaneous two edged and bottom water drive mechanism in terms of pressure distribution for the purpose of optimizing oil production. Source and Green's functions are utilized in deriving the dimensionless pressure expressions for reservoir with double edged and bottom water drive. It is assumed that the horizontal well is centrally located with the two edged water occurring both at the toe and at the heel of the well. Influences of reservoir and wellbore properties are investigated for infinite-acting flow and after infinite-acting flow conditions. Results show that, the period of infinite activity is extended if the reservoir is much larger than the length of the well and the wellbore radius is small. Furthermore, dimensionless time of attainment of steady state for all well design is strongly dependent on the reservoir extent and the reservoir anisotropy under constant rate regime.

41. Volume31,(July, 2015), pp311 – 316

© J. of NAMP

A Study of Pressure Derivatives Distribution of a Horizontal Well Subject To Simultaneous Two-Edge And Bottom Water Drive Mechanisms.

¹Edo, T. Mand ²Adewole E. S.

¹Department of Petroleum Engineering, Edo State Institute of Technology and Management, Usen

²Department of Petroleum Engineering, University of Benin, Benin City

Abstract

Pressure derivatives of the type $t_D \frac{\partial P_D}{\partial t_D}$ were investigated for a horizontal well subject to edge and bottom water drive mechanisms. The influence of dimensionless well length and wellbore radius was investigated. Characteristic curve shows that there are three distinct flow regimes (early flow regime, intermediate flow regime and the late time flow regime) with all the derivatives identical at early time and merges on a straight asymptote of slope equal to unity. The period of infinite activity is extended if the reservoir is much larger than the length of the well and the wellbore radius is small. The intermediate flow period is longer for a well with vertical flow period than a well with horizontal flow period.

Measurement of Activity Concentrations of ^{40}K , ^{226}Ra and ^{232}Th For the Assessment of Radiation Hazards from Dangora Surface Soils.

Sadiq Abubakar Muhammad

Physics Department, Federal University Of Education, Kano

Abstract

Activity concentrations of natural radionuclides ^{40}K , ^{226}Ra and ^{232}Th in surface soils from Dangora town, Kiru Local Government Area of Kano State of Nigeria were determined using gamma spectroscopy with NaI(TL) detector. The specific activities of the radionuclides range from 294.7 – 403.4Bq/Kg for ^{40}K , 24.2 – 48.9Bq/kg for ^{226}Ra and 43.9 – 78.7Bq/kg for ^{232}Th . ^{40}K ($348.2\pm 3.1\text{Bq/kg}$) and ^{226}Ra ($34.7\pm 1.5\text{Bq/kg}$) are lower than their respective world background averages of 420Bq/kg and 50Bq/kg. Average concentration of ^{232}Th is however, higher than the world mean. Result obtained for radium equivalent activities show that they range from 141.8 – 183.7Bq/kg with a mean of 137.3Bq/kg. Since these values are lower than the established upper limit (370Bq/kg), the soil from within the area of study is considered safe for use as building materials. Absorbed dose rate due to gamma irradiation at 1m above the ground surface ranges from 52.8 – 83.5nGy/h with an average of 69.3nGy/h both of which are comparable with 18-93nGy/h and 58.0nGy/h - the global range and mean respectively. Values of external hazard indices range from 0.31 – 0.50 with a mean of 0.45. Since these values are less than unity, it follows that radiation hazard due to exposure to natural background radiation is negligible. The estimated annual effective dose ranges from 0.07 – 0.10mSv with mean of 0.77mSv that is comparable with the recommended limit (0.07mSv) for normal background. Finally, it is concluded that both ^{226}Ra and ^{232}Th and their decay products are the contributors to the reportedly high level of alpha radioactivity in Dangora's water bodies but elevated by the condition of the aquifer. Due to the high level of ^{40}K concentration recorded in this work, its abundance in the environment, and also the aquifer's state, it is concluded that ^{40}K is the main contributor to the high level of beta activities recorded earlier in a water screening test.

Keywords: Absorbed Dose Rate, Activity Concentration, Annual Effective Dose, External Hazard Index, Radium Equivalent Activity

Radiation Effective Doses To Caregivers Of Patients On ^{131}I (Radioiodine) Therapy For cancer of The Thyroid at University College Hospital (UCH), Ibadan, Nigeria.

Jibiri, N.N¹, Lawal, I.O² and Olowookere, C.J³

¹Radiation and Health Physics Research Laboratory, Department of Physics,
University of Ibadan,

²Department of Nuclear Medicine, University College Hospital Ibadan, Ibadan, Nigeria.

³Department of Physical Sciences, Ajayi Crowther University, Oyo, Nigeria

Abstract

The Effective doses (ED) received by caregivers of patients on ¹³¹I (iodine-131) treatment for cancers of the thyroid have been measured. The measurements were carried at the Nuclear Medicine Department of University College Hospital (UCH), Ibadan. High sensitivity tissue equivalent thermo luminescent dosimeters (TLDs) were used for measuring the doses received by 25 caregivers who assisted 7 patients treated with various doses of ¹³¹I (Iodine-131). The number of caregivers who supported the treated patients was between 2 and 5 caregivers per patient. The mean doses received by the caregivers ranged from 0.11 to 0.92 mSv per patient. Additionally, the mean doses received by teenagers, young adults and adults were 0.31, 0.34 and 0.24 mSv respectively. The mean dose received by the caregivers is below the limit of 5.0 mSv recommended by the US Nuclear Regulatory Commission indicating that the caregivers considered in this study are at lower radiological health risk. The trend in this study shows that low doses could be achieved with adequate restriction and compliance with the safety instruction in developing countries.

Keywords: Caregiver of patients; Effective dose; Iodine-131; Teaching Hospital, Thyroid cancer

44. *Volume 31, (July, 2015), pp 331 – 336*
© J. of NAMP

Calculation of Concentration-Concentration Fluctuation $Sc_c(0)$ And Deviation In $Sc_c(0)$ from Ideal Solution Values Using Two Atoms Cluster Model (TACM) For Li-Mg and K-Na Liquid Alloys.

¹O.W. Abodunrin and ²S.S. Oluyamo

¹Department of Physics, Joseph Ayo Babalola University, Osun State, Nigeria.

²Condensed Matter and Statistical Physics Unit, Department of Physics,
Federal University of Technology, PMB 704, Akure, Nigeria

Abstract

The thermodynamic model based on cluster of two atoms is considered with the view to obtaining deviations in $Sc_c(0)$ from ideal values. Concentration-concentration fluctuation; $Sc_c(0)$ of two binary molten alloys was successfully calculated. Literature data for thermodynamic properties of these alloys are evaluated based on cluster of two atoms for each system with the view to obtaining concentration-concentration fluctuation; $Sc_c(0)$ enumerating the low order atomic correlation in the nearest neighbour shell of liquid binary alloys with the highlights of deviation in $Sc_c(0)$ of these alloys. The values of $Sc_c(0)$ for Li-Mg through the entire concentration are positive but smaller than the ideal values, the

values of $Sc(0)$ for K-Na are also positive but greater than the ideal values. The indication of the deviation in $Sc(0)$ for Li-Mg suggest heterocoordination ,the implication of the deviation in $Sc(0)$ for K-Na suggests homocoordination in the nearest neighbour shell. The values of deviation in $Sc(0)$ for Li-Mg alloy throughout the composition range are negative and positive for K-Na alloy. The $Sc(0)$ and deviation in $Sc(0)$ for Li-Mg and K-Na alloys are presented.

Keywords: Concentration-concentration fluctuation, deviation in concentration- concentration fluctuation, two atoms cluster model

45. *Volume 31, (July, 2015), pp 337 – 346*
© J. of NAMP

Higher Order Conditional Probabilities In Molten Alloys

¹O.W. Abodunrin and ²S.S. Oluyamo

¹Department of Physics, Joseph Ayo Babalola University, Osun State, Nigeria.
²Condensed Matter and Statistical Unit, Department of Physics, Federal University of Technology, PMB 704, Akure, Nigeria

Abstract

This research work examined higher order conditional probabilities of six binary molten alloys. Literature data for thermodynamic properties of these alloys are enumerated as four cluster atoms, that is (A, A, A, A) or (B, B, B, B). For each system with a view to obtaining conditional probability $\frac{A}{AAA}$ and other possibility in conditional probability $\frac{B}{BBB}$ as functions of concentration in the entire range, itemizing the higher order atomic correlation in the nearest neighbouring shell of liquid binary alloys; conditional probabilities and otherwise are invariant (all paths straight in ascending or descending manner) only for Bi-Cd liquid alloy. Some alloys have the conditional probabilities and otherwise deviate slightly from straight paths, while the remaining alloys have the conditional probabilities and otherwise obviously curved paths. This has helped to discuss how the higher order atomic correlations in liquid alloys are related to pair-wise distribution. The values of higher order conditional probabilities and otherwise computed for Bi-Cd, Li-Mg, Cd-Mg, Cd-Ga, Cu-Pb and K-Na are presented.

Keywords: Atomic correlation, ordering energy, higher order conditional probability and otherwise.

46. *Volume 31, (July, 2015), pp 347 – 362*
© J. of NAMP

Comparative Analysis of Approximation Rules for Computing the Caputo Fractional Derivatives of Functions

Abstract

In this paper, we propose two numerical methods for computing the Caputo fractional derivatives of functions by a weighted sum of function values at specified points. The first algorithm uses modified Trapezoidal rule in conjunction with a forward difference formula while the second algorithm uses the modified Trapezoidal rule in combination with a backward difference formula. Both the forward and backward difference formulas are of the second order. The error analysis for the approximation rules are presented. The approximation rules are implemented in MATLAB through some illustrative examples. Absolute errors are estimated and the orders of accuracy for the approximation rules are computed. The numerical experiments confirmed that all the approximation rules are accurate, efficient and readily implementable.

Keywords: Fractional integral; Trapezoidal Rule; Modified Trapezoidal Rule; Caputo Fractional Derivative.

47. Volume 31, (July, 2015), pp 363 – 378
© J. of NAMP

Exact and Approximate Solutions of Some Potential Energy Functions for Diatomic Molecules

¹Olufadi, Y., ¹Salami I., ¹Yahya W. A., ²Adelani, M.

¹Department of Physics and Materials Science, Kwara State University, Malete, Nigeria.

²Department of Physics, University of Ilorin, Ilorin, Nigeria.

Abstract

In this article, a one-body problem is solved analytically using the parametric Nikiforov-Uvarov method. By using the certain approximation schemes, we solved (in the non-relativistic case) the Schrödinger equation for improved Tietz potential model. We also obtained the solutions of the Schrödinger equation for improved Rosen-Morse and improved Manning-Rosen potential models from the results of the improved Tietz potential by using a certain transformation. Numerical results are obtained by considering some diatomic molecules such as NO^+ , O_2^+ , Cl_2 , and N_2^+ . Also the bound state solutions of the positive energy subspace and negative energy subspace of Dirac equation are obtained exactly in the relativistic case for s-wave only.

48. Volume 31, (July, 2015), pp 379 – 390
© J. of NAMP

Statistical Analysis of Natural Radionuclides Obtained From Sediments in Ogun River, Nigeria.

I.C Okeyode¹, N.N Jibiri², A.O Mustapha³, V. Makinde⁴ and F.G Akinboro⁵

^{1,3,4,5}Department of Physics, Federal University of Agriculture, Abeokuta, Ogun state, Nigeria

²Radiation and Health Physics Research Laboratory, Department of Physics, University of Ibadan, Ibadan, Nigeria.

Abstract

Basic statistics were used to describe statistical characteristics of radionuclides in Ogun river sediments. Conventional and multivariate statistical procedures for data treatment were performed using SPSS (version 16.0) for Windows. Descriptive statistics was used to analysis the characteristics of these radionuclides in the sediments. Variational tests and location effects size measures were conducted on the concentrations of the radionuclides. Also Pearson correlation and hierarchical cluster analysis have been applied in order to clarify the relationship among the variables. It was observed that the radionuclides did not have any correlation with one another in the upper region but in the middle and lower regions, although ⁴⁰K did not correlate with the other radionuclides but ²²⁶Ra correlated fairly well with ²³²Th. The upper region of the river indicated no location effect, but in the middle and lower regions, significant location effects were observed and these were attributable to industrial activities in the locations.

Keywords: Radionuclides, Ogun River, Statistical Analysis

49. Volume 31, (July, 2015), pp 391 – 398
© J. of NAMP

Application of Multi-Set to log linear models for arbitrary d-Dimensional Contingency Table and its Associated Closed-Form Formula for Maximum Likelihood Estimations

¹O.C. Okoli, ²N. A. Nsiegebe and ³E.I Ezenekwe

^{1,2,3}Department of Mathematics, P.M.B 02 Uli, Chukwuemeka Odumegwu Ojukwu University, Anambra State, Nigeria.

Abstract

The purpose of this research paper, is to give a classical (combinatorial) proof for the closed-form formula that evaluate the Maximum likelihood parameter estimators for certain arbitrary d-dimensional multinomial function (likelihood function) induced by an arbitrary d-dimensional Multi-index.

Keywords: Permutations, Combinations, Multi-Set, Multi-Index, Probability, contingency table.
Mathematics Subject Classification: 05A10.

Construction of Arithmetic Probability Distribution on A Defined Interval [a,b].

¹O.C. Okoli, ²N.A. Nsiegbe and ³D.F. Nwosu

^{1,2,3}Department of Mathematics, P.M.B 02 Uli, Chukwuemeka Odumegwu Ojukwu University, Anambra State, Nigeria.

³Department of Mathematics/Statistics, Federal Polytechnic Nekede, Owerri.

Abstract

Considering that events occurring at unit interval may decrease or increase arithmetically over time, we seek to define a probability distribution function on [a,b] with respect to the arithmetic distribution property of the values. It is an improvement on the well-known discrete uniform distribution.

Keywords and Phrase: Probability mass function, Arithmetic progression, Expectation.

On the Combinatorics of Finite Dimensional Multi-Set and its Associated Probability Mass Function.

¹O.C Okoli, ²N. A. Nsiegbe and ³R. N Ujumadu

^{1,2,3}Department of Mathematics, P.M.B 02 Uli, Chukwuemeka Odumegwu Ojukwu University, Anambra State, Nigeria.

Abstract

In this research paper, let $d \in \mathbb{N}$ be arbitrary but fixed, we consider the sets $X^{(d)}$ and $M(\lambda, X^{(d)})$ that is more general than the set $X = \{x_i : i = 1, 2, \dots, k\}$ and then constructed the associated probability mass function (with proof) due to certain underlying multi-index such that the index (running) variable $\bar{i}_d = i_1 i_2 \dots i_d$ or i_1, i_2, \dots, i_d is not necessarily a point (i), but rather a vector $(\bar{i}_d) = (i_1, i_2, \dots, i_d)$, where $i_r \in [k_r]$, $k_r \in \mathbb{N}$, $r \in [d]$.

Keywords and Phrase: Permutations, Combinations, Multi-Set, Multi-Index, Probability.

Application of Geometric Programming in Modelling of Solid Waste Products (Refuse): A Contribution In Combating Pollution, Uncontrolled Spending And Climate Change.

Abstract

Climate change is the common word these days as it portrays massive alterations in weather patterns around the world and disruptions to economic growth in many regions. Poor waste management not only degrade the environment but cause climate change; Global warming; depletion of Ozone layer; rapid accumulation of greenhouse gases (GHGs) in the atmosphere; erosion; desertification; acid rain; draught, earthquake, tsunamis, tornadoes, increased intensity of sunlight, global food crisis; variation in seasons; flooding etc. In this study, the researchers were able to model the solid waste products (refuse) and the cost of waste management in Enugu State per month was determined. This will help in making informed decision; create employment opportunities, healthy environment, economic growth and stability, etc. Combating climate change is in line with achieving sustainable development.

53. Volume 31, (July, 2015), pp 413 – 418
© J. of NAMP

Comparison of the Reliability of Dry Cell Batteries.

Harrison O. Amuji and Ngozi C. Umelo-Ibemere

Department of Statistics, Federal University of Technology, Owerri.

Abstract

The earlier use of the term, reliability, was purely qualitative; for example, aerospace engineers recognized the desirability of having more than one engine on an airplane and drivers keep spare tires in their vehicles without any precise measurement of the failure rate. As used today, however, reliability is a quantitative concept and this implies the need for a method of measuring reliability to eliminate some avoidable uncertainties. The objective of this study is to determine the reliability of Flash and Tiger Head dry cell batteries and to compare them. The result from the research indicates that the failure rates are $\lambda_F = 0.269$ for Flash batteries and $\lambda_T = 0.497$ for Tiger Head batteries. The reliability function are $R(t) = e^{-0.269t}$ for Flash batteries and $R(t) = e^{-0.497t}$ for Tiger Head batteries. Failure rate was established as a quality control parameter. Finally, failure-time distribution $f(t)$ for both batteries are $f(t)_F = 0.269 e^{-0.269t}$; $t > 0$ for Flash batteries and $f(t)_T = 0.497 e^{-0.497t}$; $t > 0$ for Tiger Head batteries.

A Study of Injectivity Decline of Wells in a Reservoir Intersected By a Fluid Injector

¹Odeh I.O. , ²Giegbefumwen P.U. and ³Adewole E.S

^{1,2,3}Department of Petroleum Engineering, University of Benin, Nigeria.

Abstract

Reliable prediction of injectivity decline from an injection well history provides adequate information for better planning of water treatment and well stimulation procedures for an injection programme. The accuracy of such predictions is strongly dependent on the applied model. To this regard, this work presents a systematic study of injectivity decline forecast by providing a numerical solution to the convection-diffusion pressure model for injectivity decline prediction during internal particle filtration from produced water reinjection (PWRI).

Results obtained from the implicit finite difference solution to the model showed the existence of a linear relationship between average formation porosity and permeability, as well as porosity reduction around the invaded zone during water injection. Furthermore, a study on cake development due to external filtration showed a steady increase in cake thickness around the invaded reservoir region leading to more impedance to injectivity and overall injectivity decline.

The similarity in the results obtained in this work and field observations therefore validates the suitability of the convection-diffusion pressure model [1] for the accurate prediction of injectivity decline during produced water reinjection PWRI, and also its usefulness in improving the accuracy of various existing models in the literature which are based on assumed or constant porosity values.

Keywords: produced water reinjection; convection diffusion model; implicit finite difference solution; prediction; injectivity decline; numerical model

Sensitivity Analysis in a Manpower Planning Model

¹S.A. Ogumeyo and ²P.O. Ekoko

¹Department of Mathematics, Delta State College of Physical, Education,
Mosogar, Delta State, Nigeria.

²Department of Mathematics, University of Benin, Benin City,
Edo State, Nigeria.

Abstract

Sensitivity analysis deals with the investigation into various changes in the optimum solution of a model due to changes in the original data. This paper examines the sensitivity analysis of a manpower planning model using linear programming and dynamic programming techniques which includes changes in the objective function coefficients and changes in the right hand side values of the DP model. It is observed that the number of staff recruited and retrenched or retired are equal to the maximum number of staff anticipated(H) in the manpower system. It is also observed that the objective function value is highest when H is increased by two units and the initial number of staff (h) is increased by one unit.

Keywords: Manpower Planning, Recruitment, Wastage, Linear Programming, Dynamic Programming.

56. *Volume 31, (July, 2015), pp441 – 450*
© *J. of NAMP*

Application of Euler Method (EM) for the Solution of Some First Order Differential Equations With Initial Value Problems (IVP's)

¹*D. I. Lanlege,* ²*U. M. Garba,* ³*U. M. Gana and* ⁴*M.O. Adetutu*

^{1,2,3}**Department of Mathematics/Computer Science**
Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria.

⁴**Department of Mathematics/Statistics**
Federal University of Technology Minna, Niger State Nigeria.

Abstract

The attempt to solve problems in science and technology, gradually led to mathematical models. Mathematical models involve equations in which functions and derivatives play important roles. However the theoretical development of this branch of mathematics – Ordinary Differential Equations (ODE), has its origin rooted in a small number of mathematical problems. Therefore, Differential equations (DE) can be solved using many methods that are generally accepted in Mathematics. However, it is believed that one method should be more accurate, efficient, sufficient and unique than the other. Thus; solutions of First order Differential Equations (FOD's) with Initial Value Problems (IVP's) by Euler Method (EM) will be of central concern. However numerical computational algorithm, convergence rate, approximation errors and uniqueness will be seriously inspected and to ascertain Euler Method modification requirement in order to be more stable and reliable over other methods for the FODE's with IVP's.

Keywords: Error estimate, Initial Value problem (IVP), (FODE), Euler Method (EM), Exact Solution (ES). Convergence rate, Analytical Solution, First Order Differential Equation Numerical Solution.

57. *Volume 31, (July, 2015), pp 451 – 454*
© *J. of NAMP*

On The Solution of Riccati Equation Using Laplace Transform Decomposition Algorithm (LTDA)

R.A Mustapha and A.M. Kassim

Department of Mathematics, Faculty of Science, Lagos State University, Ojo, Lagos,
Nigeria.

Abstract

In this paper, a laplace transform decomposition algorithm (LTDA) is proposed to solve Riccati equation. Comparisons are made among the Adomian Decomposition Method (ADM) and the proposed method. It is shown that the proposed method is equivalent to the adomian decomposition method for solving the Riccati equation.

Keywords: Laplace transforms decomposition algorithm, Adomian decomposition method, Riccati equation and Homotopy Perturbation Method.

58. *Volume 31, (July, 2015), pp 455 – 458*
© *J. of NAMP*

Solution of Riccati Differential Equation with Variable Co-Efficient By Differential Transform Method

¹R.A Mustapha and ²G.A Idowu

Department of Mathematics, Faculty of Science, Lagos State University, Ojo, Lagos,
Nigeria.

Abstract

In this paper differential transform method (DTM) is implemented to solve some Riccati differential equations with variable coefficient. This technique does not require any discretization, linearization or small perturbations and therefore, it reduces significantly the numerical computation. The results derived by these methods are compared with the numerical results derived by Runge Kutta 4 (RK4) method.

Keywords: Riccati equation, differential transform method and classical Runge Kutta 4 method.

59. *Volume 31, (July, 2015), pp 459 – 464*
© *J. of NAMP*

Approximate Method for Solving Fractional Riccati Differential Equation

¹R.A Mustapha and ²G.A Idowu

Department of Mathematics, Faculty of Science, Lagos State University, Ojo, Lagos,
Nigeria.

Abstract

In this paper, Chebyshev Spectral method is presented for solving the non-linear Fractional Riccati Differential Equation (FRDE). The fractional derivative is described in the Caputo sense. The properties of the Chebyshev polynomials are used to reduce FRDE to the solution of non-linear system of algebraic equation using Newton iteration method. Numerical results are introduced to satisfy the accuracy and applicability of the proposed method.

Keywords: Fractional Riccati differential equation; caputo fractional derivative; Chebyshev Spectral method.

60. Volume 31, (July, 2015), pp 465 – 476
© J. of NAMP

Determination of Vibrational Frequencies, Homo-Lumo Energy And IR-Spectra of Nucleobases (Adenine, Cytosine, Guanine, Thymine And Uracil)

A.S Gidado, G.Babaji and M.Ado

Department of Physics, Bayero University Kano PMB 3011.

Abstract

Nucleic acid bases are fundamental biological entities, as building blocks of the genetic code. The five nucleic acid bases, cytosine, thymine, uracil, adenine, and guanine, found in DNA and RNA control the replication of DNA, store information required to synthesize proteins, and translate this information to the protein. This paper reports the vibrational frequencies, HOMO-LUMO energy, zero point vibrational energy and ir-spectra of the five nucleobases calculated from FHI-aims Code. Local Density Approximation of the Perdew-Wang, (pw-LDA) and Generalized Gradient Approximation of the Perdew-Burke-Ernzerhof (pbe-GGA) exchange correlations were employed to perform the task. The ultimate goal is to compare the performance of the two exchange correlations; LDA and GGA and to show how they relate to previously reported experimental and theoretical works. Results obtained for vibrational frequencies, HOMO-LUMO energy and zero point vibrational energy were found to be in good agreement with previously reported works. For instance, zero point vibrational energy for guanine in this work were found to be 3.11eV (LDA) and 3.08eV (GGA) while from a previously reported work, it was found to be 3.19eV. The HOMO-LUMO energy gap obtained in cytosine for this work are 3.46eV (LDA) and 3.41eV (GGA) whereas a previously reported work was 3.53eV. Guanine has the largest HOMO-LUMO gap implying that it is the most stable in chemical reactions. This is followed by adenine, uracil, thymine and cytosine being the least stable. The ir-spectra of these molecules were plotted and various frequencies corresponding to the most intense peaks have been identified.

Keywords: Nucleobases, HOMO-LUMO, RNA, DNA and IR-spectra.

61. Volume 31, (July, 2015), pp 477 – 484
© J. of NAMP

The Effect of Dust Particles On Instability Due To Electron Beam In Ionospheric Plasma

B. Ekong¹, A. M. Nura², and Y. I. Yola³

¹Physics Department, School of Science Education, Federal College of Education(Technical) Bichi

^{2,3}Department of Physics, Bayero University, Kano

Abstract

Dusty plasma consists of electrons, ions, and charged dust particles observed in several astro- and space- physical environments, such as nebulas, cometary tails, planetary rings, and planetary ionospheres. This paper takes a look at the effect of these dust particles on the instability growth rate in ionospheric plasma by altering the input parameters of the normal beam plasma instability simulation of the Electrostatic One Dimensional Code (ES1), to include dust species. The results of the simulation which are given in form of plots of diagnostic parameters such as kinetic energy, as well as total energy as a function of time are found. The kinetic energy (E_1) of the hot electron beam was found to decrease with time, while the kinetic energies (E_2) of the warm ion, and (E_3) for the warm dust where found to increase with time, which is indicating that energy has been transferred from the hot electron beam to the warm plasma ions and dust. The total energy was found to be constant from time $t = 10\omega_p^{-1}$ to $t = 20\omega_p^{-1}$, but varies slightly by 6% for $t = 30\omega_p^{-1}$, which is within the limit of numerical error. The growth rate was found to be approximately $0.04\omega_p$, which is close to the theoretical value of $0.05\omega_p$, from literature. The electrostatic electric field energy for mode1 was found to be the strongest for all the timest = $10\omega_p^{-1}$ to $t = 30\omega_p^{-1}$, followed by mode2 and mode3, which is in agreement with theory.

Keywords: dusty plasma, ionospheric plasma, particle in cell, weighting, growth rate, electrostatic electric field energy.

62. *Journal of the Nigerian Association of Mathematical Physics*
Volume31,(July, 2015), pp 485 – 492
© J. of NAMP

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

[*J. Nig. Assoc. Math. Phys. Vol.30 (May, 2015), pp 329 – 336*]

C. E. Akhabue and G. E. Osamwonyi

Department of Chemical Engineering, University of Benin, Nigeria.

The number of Authors in this paper is wrongly typesetted as three, instead of two, in pages 330 – 336 in the vol. 30 issue of the Journal of NAMP. The entire pages of the article is therefore reproduced as it ought to appear.

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.