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1. Volume 25 (November, 2013), pp 1 – 10
Nanometric Scale Surface Science and the Markov Chain Monte Carlo
Simulation of Disordered Systems

Oluwole E. Oyewande
Department of Physics,
University of Ibadan, Ibadan, Nigeria.

Abstract

The Markov chain Monte Carlo method as a statistical mechanics technique for the study of macroscopic systems has furnished the scientific community with great knowledge and advances in the theory of phase transitions. While a number of Monte Carlo models have been proposed for the study of surface growth, these models have not nearly being studied as exhaustively as in the models of magnetic systems, a paradigm of which is the classical model of Ernest Ising. In particular, studies of phase transitions in surface/interface science at nanometric scales are almost non-existent. This article has been written to motivate research in this area of statistical mechanics from the perspective of surface science. In this article we survey the rudiments of the method along with some models of disordered systems such as magnetic systems, material fracture, nano-pattern formation under ion bombardment, and molecular chirality. We performed simulations of these models using the method and obtained results that are in excellent agreement with experimental observations.

2. *Volume 25* (November, 2013), pp 11 – 22

A Remark on the Definition of the Integral

Sunday Oluyemi

**Department of Pure and Applied Mathematics,
Ladoke Akintola University of Technology,
P.M.B 4000, Ogbomoso, NIGERIA.**

Abstract

Let (X, A, μ) be a measure space, $\emptyset \neq A \in A$, $A \neq X$, and $f : X \rightarrow \mathbb{R}^c$ and $g : A \rightarrow \mathbb{R}^c$ extended real-valued measurable functions. The literature defines the integral of f [the ground set of the measure space (X, A, μ) , X , is the domain of f] directly, but defines the integral of g [the domain of g is not the whole of X] (See “(rather than the entire space)” line 10, p.65 of [1]) as the integral of $g^* : X \rightarrow \mathbb{R}^c$ (if it exists) (See “(if it exists)” line 11, p.65 of [1])

$$\text{where } g^*(x) = \begin{cases} g(x), & \text{if } x \in A \\ 0, & \text{if } x \notin A \end{cases}$$

In this paper we define the integral of measurable $h : A \rightarrow \mathbb{R}^c$, $A \in A$, $A \neq X$, or $A = X$, directly. Our definition, which is essentially the literature’s definition, captures the definition of the integrals of f and g in the literature. Some useful deductions and consequences are then given.

3. *Volume 25* (November, 2013), pp 23 – 26

A Remark on the Integrability of the Sum and Difference of Real-Valued Functions

Sunday Oluyemi

**Department of Pure and Applied Mathematics,
Ladoke Akintola University of Technology,
P.M.B 4000, Ogbomoso, NIGERIA.**

Abstract

We establish a theorem on the integrability of the sum $f + g$ and the difference $f - g$ of extended real-valued integrable $f, g : (X, A, \mu) \rightarrow \mathbb{R}^c = \mathbb{R} \cup \{\infty, -\infty\}$ ((X, A, μ) a measure space) that is implicit in the literature and employed but rarely explicitly stated (if at all) and rarely explicitly proved. We point out the important instance of the proof of Fubini’s Theorem where it is employed by a number of authors, but without citing it.

2010 Amer. Math. Soc. Subject Classification 28(Classical Measure Theory) 28A, 25.
Keywords: Measure space, measurable function, integral, Fubini’s Theorem.

4. *Volume 25* (November, 2013), pp 27 – 32

Specific Heat of the 2D Hubbard Model: QUEST Approach.

¹Iyorzor Ben.E., ¹Babalola M. I., ²E nukpere E. E. and ¹Idiodi J. O. A.

¹Department of Physics,

University of Benin, Benin City, Nigeria.

²College of Education, Warri, Nigeria.

Abstract

The specific heat was studied as a function of temperature within the two – dimensional Hubbard model with various values of the on-site Coulombic repulsion U ranging from 2 to 16 using the Quantum Electron simulation Toolbox (QUEST) approach at half-filling. Two distinct features were identified: (1) A low temperature peak appeared when the low lying spin states are excited, and (2) a higher temperature broad peak appeared when states in the upper Hubbard band are excited. It was also observed that in the weak coupling regime the low temperature peak moves to slightly higher temperature as U increases, reaching a turning point at $U \approx 11$.

Keywords: strongly correlated electrons; superconductivity; specific heat; half-filling; coupling regime; on-site Coulombic repulsion.

5. *Volume 25* (November, 2013), pp 33 – 36

Calculation of momentum distributions of ^{10}Be fragment from $^{11}\text{Be} + ^9\text{Be}$ reaction using the Glauber Theory

I. D. Adamu

Department of Physics,

Bayero University, Kano, Nigeria

Abstract

The momentum distributions of ^{10}Be core fragment from the $^{11}\text{Be} + ^9\text{Be}$ reaction system are computed in the framework of the Glauber Theory using the CSC_GM code. The CSC_GM code used in the computations was obtained from the CPC Program Library, Queen's University of Belfast, N. Ireland. The CSC_GM code is a Fortran 90 program that was originally run on UNIX operating system. The code was modified and run on Windows xp. The projectile nucleus is assumed to have the structure of a core plus valence nucleon. The input data needed for the calculations are the core and target densities and the nucleon-nucleon profile function. Results are found to agree with the experimental data, especially at high incident energies.

Keywords: Glauber model, Momentum distribution, Nucleon-removal cross section.

6. *Volume 25* (November, 2013), pp 37 – 42

Embedded atom method for face centered cubic metals:

A Simple Algorithmic Approach

Matthew-Ojelabi F. and Ajibade I. I.

Department of Physics, Ekiti State University,

PMB 5363, Ado Ekiti, Ekiti State. Nigeria

Abstract

An analytical expression derived for the embedding energy function $F(\rho)$ in an earlier work has been used to study more fcc monatomic metals. The parameters for the model were obtained from the available experimental physical quantities. Our physically well-motivated and transferrable $F(\rho)$ was able to reproduce the surface energies and other structural properties of nine fcc metals as established by the calculated results.

Keywords: Embedding energy method (EAM), Embedding energy function $F(\rho)$ and surface energies.

7. *Volume 25* (November, 2013), pp 43 – 46

Modified Variational Iteration Method for the Analytical

Solution of Nonlinear Advection Equations

¹*A.W. Gbolagade, ²K.O. Kareem & ¹M.O. Olayiwola*

¹*Department of Mathematical & Physical Sciences,*

College of Science, Engineering & Technology,

Osun State University, Osogbo, Nigeria.

²*Department of Mathematical Sciences,*

Olubisi Onabanjo University, Ago-Iwoye, Nigeria.

Abstract

In this paper, a Modified Variational Iteration Method (MVIM) for the solution of nonlinear advection equations is presented. The method is an elegant combination of the Taylor's approximation and the variational iteration method. The method is seen to be a very reliable alternative to some existing techniques for the nonlinear advection equations.

Keywords: Advection equation, Taylor's approximation, Lagrange Multiplier.

8. *Volume 25* (November, 2013), pp 47 – 50

Closed form Solution of Some Nonlinear Partial Differential Equations

Onugha, E. E. and Erumaka, E. N.

Department of Mathematics,

Federal University of Technology, Owerri, Nigeria

Abstract

Method of finding the closed form solution of nonlinear partial differential equations using the Monge method is discussed. The method

leads to finding one or two intermediate integrals from which a complete integral which is the solution of the given nonlinear partial differential equation is got by eliminating some arbitrary functions. The method is demonstrated by finding the closed form solution of some typical nonlinear partial differential equations.

Keywords: Measure space, Measurable function, Integral, Radon-Nikodym Theorem.

9. **Volume 25 (November, 2013), pp 51 – 54**
Error Control of Initial Value Problems for Stiff Ordinary Differential Equations Using Neumaier’s Method

George N. Emenogu

**Department of Mathematics
Michael Okpara University of Agriculture,
Umudike, Abia State, Nigeria**

Abstract

Validated methods when compared with standard numerical methods for initial value problems (IVPs) for ordinary differential equations (ODEs) not only compute a numerical solution to a problem, but also generate guaranteed global error bounds associated with the numerical solution. There have been significant developments in the field of validated numerical methods for IVPs over the past few decades. However, none of the validated methods developed to date are suitable for stiff problems. This paper investigated the potential of Neumaier’s validated methods for solving stiff IVPs for ODEs. Neumaier’s result which is a special case of Dahlquist’s [1] result shows from our findings an effective validated method for stiff IVPs for ODEs, for problems where there is no wrapping effect.

10. **Volume 25 (November, 2013), pp 55 – 58**
Some Integration Formulas for Improper Integrals of the First Kind (Involving Exponential Functions) Obtained By Laplace Transform Techniques

George N. Emenogu

**Department of Mathematics
Michael Okpara University of Agriculture,
Umudike, Abia State, Nigeria**

Abstract

In this paper, we have shown how to use the Laplace transform technique to obtain integration formulas for some improper integrals of the first kind involving exponential functions. Some illustrative examples such as;

$$\int_0^{\infty} x^b e^{-ax} dx = \frac{\Gamma(b+1)}{a^{b+1}} \quad a > 0, b > -1$$
$$= \frac{b!}{a^{b+1}} \quad a > 0, b = 0, 1, 2, 3, \dots$$

found in table of integrals of type [1], were given. Some of these integrals can also be evaluated by the longer method of integration by parts.

11. *Volume 25* (November, 2013), pp 59 – 64

Derivation of Properties of Shifted Legendre Polynomials

Peter Vanenchii AYOO

**Department of Mathematics,
Federal University Lafia, PMB 146 Lafia–Nigeria.**

Abstract

These four properties of the Legendre polynomials: Rodrigues' formula, mutual orthogonality, generating function and recurrence formula are discussed in passing. The linear change of variable is employed to transform the Legendre polynomials to the shifted Legendre polynomials. The above properties are then derived in detail for shifted Legendre polynomials. Furthermore, certain theorems are used to prove that the derived Rodrigues' formula and the recurrence relation properties actually satisfy the shifted Legendre equation.

MSC2010: 42C10

Keywords: Shifted Legendre polynomials, Rodrigues' formula, mutual orthogonality, generating function, recurrence formulae, linear change of variable.

12. *Volume 25* (November, 2013), pp 65 – 76

**Response Analysis of Euler-Bernoulli Beam Subjected
To Partially Distributed Loa**

M. A. Usman

**Department of Mathematical Sciences
Olabisi Onabanjo University, Ago-Iwoye, Ogun State.**

Abstract

This paper investigates the dynamic behavior of beams most especially the Euler-Bernoulli beam with structural damping coefficient subjected to Partially Distributed Moving Loads. The governing Partial differential equation is solved using analytical-numerical method. It was observed that as damping increases, the resultant solution from transformed equation also increases keeping the fixed length of the beam constant.

13. *Volume 25* (November, 2013), pp 77 – 80

Stresses and Deformation in a Neo-Hookean Half-Space Deforming Under Anti-Plane Shear Loading

Erumaka E. N. And Onugha E. E.

Department of Mathematics

Federal University of Technology, Owerri, Nigeria

Abstract

Anti-plane shear deformation of a Neo-Hookean half-space is studied. The analysis of a cylindrical section of the material leads to a single linear partial differential equation for the determination of stresses and displacement. An asymptotic solution of the boundary value problem is sought for in a Sobolev space of order 2. The method gives exact solutions for the case of a halfspace containing a central circular cavity and the case in which the central cavity is patched with a solid inclusion.

14. *Volume 25* (November, 2013), pp 81 – 108

The Effect of Viscosity and Thermal Conductivity on Magnetohydrodynamic Two-Phase Flow under Optically Thick Limit Radiation.

Usman M. A. and Onitilo S. A.

Department of Mathematical Science,

Olabisi Onabanjo University Ago-Iwoye, Ogun State, Nigeria.

Abstract

This paper investigates the effect of viscosity and thermal conductivity on magnetohydrodynamic two-phase flow under optically thick limit radiation in which an open-ended vertical channel is taken as the domain and the boundary is given as $-1 \leq \xi \leq 1$. The solutions for temperature, velocity and the induced magnetic field for both gas and liquid were obtained, in the optically thick limit radiation using the method of successive approximation. The Continuity, Momentum and Energy equations were formulated, non-dimensionalized and solved. We observed that increase in radiation parameter for gas and liquid increase the rate of heat transfer to the fluid (gas and liquid) and this leads to an increase in temperature. Also increase in velocity for gas and liquid decrease as the radiation parameter increases. It was also observed that an increase in radiation parameter causes an increase in the flow rate of both gas and liquid.

Keywords: MHD, Two-Phase Flow, Thermal Radiation, Conductivity, Viscosity.

15. *Volume 25* (November, 2013), pp 109 – 116

A Convective MHD Flow of a Micropolar Fluid Past a Stretched Permeable Surface with Radiation

Aiyesimi Y. M., Yusuf A. and Jiya M.
Department of Mathematics and Statistics,
Federal University of Technology, PMB 65, Minna,
00176-0000 Nigeria, Niger State, Nigeria

Abstract

MHD flow of a micropolar fluid past a stretched permeable surface with heat generation or absorption was considered in this work. The governing partial differential equations were transformed into their equivalent cylindrical coordinate system from its original form (rectangular form). A set of similarity parameters are employed to convert the governing partial differential equations to ordinary differential equations. The obtained self-similar equations are solved using the Adomian Decomposition Method. The effect of various physical parameters on the velocity profile, microrotation and temperature distribution were investigated. The obtained results shows that as the Hartmann number (Ha) increase the velocity profile and the microrotation reduce while the temperature profile increases.

Keywords: Convective, MHD, Adomian decomposition, Micropolar, Radiation.

16. **Volume 25 (November, 2013), pp 117 – 122**

A Note on Boundary Layer Theory

Eyo A. E.

Department of Mathematics & Statistics
University of Uyo, Uyo, Nigeria

Abstract

For the case of laminar boundary layer flow over a flat plate with zero angle of incidence and pressure gradient we derive the relation for energy thickness of Wieghardt [1] (i.e the balance between mechanical energy loss and heat generated by fluid friction), (see also Schlichting [2]). By applying a parabolic velocity profile in the relation for energy thickness and also in Karman-Pohlhausen [3] momentum integral equation an approximate value of the boundary layer thickness is determined. Comparison of the approximate value with the exact Blasius [4] value leads to the determination of the percentage error for this parameter. It is observed that as the boundary layer flow becomes more laminar (i.e $Re \ll 5 \times 10^5$), where Re is the Reynolds number, the boundary layer thickness increases accordingly with consequent increase in the percentage error.

Keywords: Laminar, boundary layer, flat plate, zero angle of incidence.

17. **Volume 25 (November, 2013), pp 123 – 128**

The Effects of Charged Dust Inhomogeneities on the Propagation of Low Frequency Waves in a Magnetized Plasma

¹Ocheje J. A. and ²Anchaver R. S.

¹Department of Pure and Applied Physics,
Federal University, Wukari, Taraba State.

²Department of Physics,
Benue State University, Makurdi, Benue State.

Abstract

A linear dispersion relation for magnetized, collisionless dusty plasma containing Boltzmann distributed ions and electrons, and highly negatively charged micron sized dust grains has been derived. The effects of charged dust inhomogeneities on the propagation of low-frequency waves have been investigated. It is found that the presence of the charged dust grains modifies the existing plasma wave spectra and that there is damping of the normal modes even in the absence of dust charge dynamics.

Keywords: Dispersion, inhomogeneity, low frequency, normal modes, damping.

18. *Volume 25* (November, 2013), pp 129 – 134

Simulation of Positron Beam Driven Plasma Wakefield Acceleration Using the Particle-In-Cell Code, Oopic

¹*Haruna M. A. and ²Anchaver R. S.*

¹Tabuka Global Academy,
Gwarzo, Kano, Nigeria

²Dept. of Physics, Benue State University,
P.M.B. 102119, Makurdi, Nigeria.

Abstract

We use a 2-d object oriented particle-in-cell simulation code (OOPIC) to model the interaction of positron beam with plasma. A 28.5 GeV positron beam passes through 1 metre of pre-ionized lithium plasma. The interaction regime is in the magnetically self-focussed (beam radius is much less than the plasma wavelength). The plasma electrons are blown out creating a large amplitude wake of about 3×10^{-4} m, driven by a strong axial electric field E_z of order 1Gv/m, which is used in accelerating the electrons to high energies. This is in good agreement with the Stanford linear accelerator centre (SLAC) E-157 experiment.

Keywords: plasma acceleration, wake field, positron beam, particle-in-cell (PIC), perturbation.

19. *Volume 25* (November, 2013), pp 135 – 140

Analytical Solution of a Tuberculosis Epidemic Model Using Homotopy Analysis Method

¹*Ibrahim M. O. and ²Egbetade S. A.*

¹Department of Mathematics,
University of Ilorin, Ilorin

²Department of Mathematics & Statistics,
The Polytechnic, Ibadan

Abstract

In this paper, we describe a powerful, easy to use analytical technique known as homotopy analysis method (HAM). The HAM is then applied to nonlinear equations describing the transmission dynamics of tuberculosis

epidemics. The method yields series solutions that are reasonable and easy to express. Our results reveal that HAM is very effective and simple.

Keywords: tuberculosis, homotopy analysis method, nonlinear equations, mathematical model, epidemics

20. *Volume 25* (November, 2013), pp 141 – 146

A Class of Some Explicit S-Stage of Ordered Runge-Kutta Methods

Arowolo O. T., Kareem R. A. and Salawu S. O.

Department of Mathematics

Lagos State Polytechnic, Ikorodu, Nigeria

Abstract

In this paper, a class of some explicit s-stage of ordered Runge-Kutta methods were investigated. Some explicit schemes were developed based on the first order ordinary differential equation using Taylor series expansion method. These methods were implemented and evaluated on a sampled problem. The error terms from the results show that the methods are accurate, stable and consistence.

Keywords: Runge-Kutta methods, Taylor series.

21. *Volume 25* (November, 2013), pp 147 – 156

On an Adaptive Method for Radial Basis Function Interpolation

Terhemen Aboiyar and Tersoo Luga

Department of Mathematics/Statistics/Computer Science,

University of Agriculture, PMB 2373, Makurdi, Nigeria

Abstract

In this paper, we have used two radial basis functions namely, multiquadrics and the thin plate splines to implement the adaptive residual subsampling method in one dimension. Two functions with localized features were chosen to establish the efficiency of the adaptive method and illustrate the advantages of the adaptive radial basis function interpolation over radial basis function interpolation on uniform grids in one dimension. The numerical results show that the adaptive radial basis function interpolation method performed better with the thin plate splines than the multiquadrics and also the adaptive interpolation method yields a better approximation to functions that have localized features than radial basis function interpolation on uniform grids.

Keywords: radial basis functions, adaptive interpolation, multiquadrics, thin plate splines.

22. *Volume 25* (November, 2013), pp 157 – 172

Investigation of the Groundwater Resources and Aquifer Characteristics in Utagba-Uno Area, Delta State, Nigeria Using Surface Geoelectric Sounding

Oseji, Julius Otutu

Delta State University, Abraka Delta State, Nigeria

Abstract

A study was carried out in Utagba-uno to obtain the type and distribution of near surface aquifers and also to determine the flow direction, transmissivity and conductivity of the aquifer using the Schlumberger electrode configuration of Vertical electrical sounding, the global positioning system (GPS) and a measuring tape.

The results of vertical electrical soundings revealed that boreholes for sustainable water supply should be drilled to the fourth layer (medium grained sand) at a depth of between 20m - 30m in Utagba-uno road Ndemili, Umusam Onicha-Ukwuani road, Eke market road Umusedeli, Umusadege Ekilibi road, Adofi road Ekilibi and Adofi road Etua,. This is the best aquifer in Utagba-uno area; however, in locations within Umuseti major road and Odas road Isumpe, boreholes could be drilled to the third layer (fine grained sand) to a depth of about 10m – 15m. While in the locations at Market road Ndemili and along Etua major road, boreholes could also be drilled to the third layer (fine grained sand) to a depth of about 10m – 12m, but they are not encouraging formation for groundwater exploitation.

The Dar Zarrouk parameters were used in estimating the transmissivity which ranged between $54\text{m}^2/\text{day}$ - $245\text{m}^2/\text{day}$ with an average of $122.3\text{m}^2/\text{day}$. Umusam Onicha Ukwuani road having the highest transmissivity value of $245\text{m}^2/\text{day}$ and a reasonable aquifer thickness should be the location for any concentrated ground water project in Utagba-uno. Based on the hydraulic gradient obtained from the different wells, ground water flows from Ndemili down to Isumpe with an average hydraulic gradient of 0.0439.

The contour of map of the static water level at Utagba-uno revealed that the ground water flows toward the southern part of the region. It is therefore recommended that dumpsites should be sited within the Southern part of Utagba-uno and none in the north, west and eastern part of Utagba-uno in order to minimize contamination. Boreholes therefore should be sited within the north, east and western part of Utagba-uno for potable and sustainable water supply.

Keywords: Groundwater Potential, Vertical electrical sounding, Aquifer, contour map, driller's log, geoelectric section, transmissivity, hydraulic gradient, meter tape, longitude, latitude, dumpsite and flow direction.

23. *Volume 25 (November, 2013), pp 173 – 176*

Atmospheric Corrosion of Roofing Sheets Due To Gas Flaring In The Vicinity of Kwaleiokpai Gas Plant, Delta State, Nigeria

Oseji, Julius Otutu

Delta State University, Abraka Delta State, Nigeria

Abstract

The roofing materials used in most buildings in Nigeria and Delta State in particular are the Asbestos, Galvanized Iron, Long span Aluminum and oil Painted Galvanized Iron sheets respectively. The atmospheric corrosion of these roofing sheets in gas flaring (Polluted Industrial) atmosphere of Kwale/Okpai environs in Delta State has been studied. The weight loss method was applied in the study. In this method, specimen of roofing sheets were exposed to the polluted atmosphere within Kwale/Olcpai environs (Experiment) and another at Ndemili (Control) while some of the mechanical properties were examined before and after exposure at 20 days intervals and for a maximum of 140 days. Results obtained revealed high corrosion rate for galvanized iron roofing sheets whereas the long span aluminum and asbestos sheets were relatively resistance to corrosion. Furthermore, the corrosion rates at Ndemili and Kwale/Okpai environs are within 0.4×10^{-6} mm per day and 2.2×10^{-6} mm per day for galvanized Iron sheet respectively. The major aim of any

scientific research is to improve the living condition of the immediate communities and suggest possible ameliorating ways. In the study area, the roofing sheets are easily attacked by rust, hence it is pertinent to recommend the best roofing sheet within the said environment and publish same for public consumption and for those who could not afford an EIA (Environmental Impact Assessments) report before erecting buildings.

Keywords: corrosion, Gas Flaring, Roofing Sheets, Atmosphere.

24. *Volume 25* (November, 2013), pp 177 – 182

Comparative Analysis of Drilling Waste Disposal Method

Ogbeide, P. O. and Onaiwu, O. D.

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

Abstract

Biodegradation, Stabilization, Incineration (Burning) and re-injection methods of handling drilling wastes were investigated and the central objective is a comparative analysis of drilling waste disposal methods, while the specific objective is to examine the various methods of managing drilling wastes and adapt the technique which is more effective and efficient.

The re-injection method is chosen based on the fact that it gives permanent 'elimination' of the waste (s) from the environment. The stabilization method causes great corrosion to the adjacent properties (materials). The biodegradation was not chosen because of the disadvantages such as the presence of resins and asphaltenes, which are resistant to biodegradation and sometimes the environmental conditions may not be favorable for the micro-organism to act on the waste material(s). The incineration method causes atmospheric pollution and has a very short life span. The pre-treatment of the waste, such as flocculation, should be carried out before adopting the re-injection method.

Keywords: Re-injection method, Biodegradation, Drilling Waste, Flocculation, Fixation process, Associated Gas, Mist Droplets, Effluent limitation. Osmotic Effect.

25. *Volume 25* (November, 2013), pp 183 – 186

Lithologic Deduction from Resistivity Studies in Nkwegu, Nigeria

¹*Agha S. O. and* ²*Nnabo P. N.*

¹**Dept. of Industrial Physics,
Ebonyi State University, Abakaliki.**

²**Dept. of Geology and Exploration Geophysics,
Ebonyi State University, Abakaliki.**

Abstract

Direct current (D.C) resistivity method was used to study the sub-surface lithology of Nkwegu. Data obtained through depth sounding from four locations within the study area were used in the analysis. The ABEM terrameter signal averaging system (SAS 300C) was the equipment used and schlumberger electrode configuration was employed. The maximum current electrode spread was 300meters. Computer modelling was used for the

interpretation of the field data. The depth sounding in two of the locations revealed four geoelectric layers while the sounding in the other two locations revealed five geoelectric layers. The result shows that the average resistivity and thickness of earth layers in the study area from the surface are 917.64 Ω m and 1.3m for the first layer; 138.89 Ω m and 8.8m for the second layer; 480.82 Ω m and 17.9m for the third layer and 65.96 Ω m and 21.5m for the fourth layer respectively. The result indicates that the first four layers of Nkwegu are made up of lateritic overburden, wet feruginised clay, fissile dry shale and consolidated wet shale accordingly.

Keywords: Resistivity, Geoelectric, Schlumberger, Overburden.

26. *Volume 25* (November, 2013), pp 187 – 190

Evaluation of Gross Alpha and Beta Radioactivity in Underground Water Within Makurdi Metropolitan City

¹Akaagerger N. B., ²Tyovenda A. A. and ³Aiyohuyin E. O.

¹Department of Physics,

Benue State University Makurdi, Benue State- Nigeria.

²Department of Physics,

University of Mkar, Mkar, Benue State- Nigeria.

³Department of Physics,

University of Benin, Edo State-Nigeria

Abstract

An evaluation of gross alpha and beta radioactivity in ground water in Makurdi Metropolis has been studied. In this work, samples were drawn at random from 12 underground water sources. The samples were drawn in two liters of plastic containers; 10ml of nitric acid was added to acidify the water and preserve most trace metals and minimize absorption on the walls of the container. The samples were evaporated to dryness at room temperature and the residue transferred into planchett. They were then counted for gross alpha and beta radioactivity in one-channel gas filled proportional counter. The detector was characterized for background limit. Results obtained from the analysis shows that the alpha activity in the samples ranges from $0.15 \pm 0.03 \text{ BqL}^{-1}$ to $0.68 \pm 0.06 \text{ BqL}^{-1}$ and the beta activity ranges from $0.37 \pm 0.03 \text{ BqL}^{-1}$ to $1.22 \pm 0.04 \text{ BqL}^{-1}$. The results show that the maximum alpha activity of $0.68 \pm 0.06 \text{ BqL}^{-1}$ is slightly above the acceptable screening radioactivity level of 0.5 BqL^{-1} set by International commission on Radiological Protection and World Health Organization. Also the maximum measured beta activity of $1.22 \pm 0.04 \text{ BqL}^{-1}$ is above the safety limit of 1 BqL^{-1} set by International commission on Radiological Protection and World Health Organization. We do recommend that for drinking purpose, it will be safer to treat some of the underground drinking water using reverse osmosis in order to reduce the activity levels.

Keywords: radiological parameters, underground water, radioactivity and biological risk.

27. *Volume 25* (November, 2013), pp 191 – 202

Distinction between Lithogenic and Anthropogenic Sources of Magnetic Susceptibility Enhancement in Urban Soil Profiles from Jalingo, Taraba State, N-E Nigeria.

¹Kanu M. O., ²Meludu O. C., ²Oniku S. A. and ³Abong A. A.

¹Department of Physics, Taraba State University,
P. M. B. 1167, Jalingo, Taraba State, Nigeria.

²Modibbo Adama University of Technology,
P. M. B. 2076, Yola, Adamawa State, Nigeria.

³Department of Physics, Cross River University of Technology,
P.M.B. 1123, Calabar, Cross River State, Nigeria.

Abstract

Magnetic properties of soils reflect different effects of soil mineralogy. The minerals present in soils due to either natural (lithogenic or pedogenic) or anthropogenic (human activities) origin. The distinction between natural and anthropogenic magnetic signal is crucial for interpretation of the source of magnetic signature. In order to discriminate between both sources, magnetic measurements, basically low field mass specific magnetic susceptibility and its frequency dependence have been performed on samples from seven vertical soil profiles (labeled AWQ1, AWQ2, ABF1, STI, MYG, SGR and MGM) within the same geological setting. Results showed that all the samples in all the profiles had moderate to high magnetic susceptibility values indicating magnetic enhancement in the study area. Varying sources of magnetic enhancement was observed with profiles AWQ2, STI and MGM showing lithogenic magnetic enhancement as the magnetic susceptibility values increased with depth. Profiles ABF1 and SGR showed anthropogenic magnetic enhancement with high magnetic susceptibility values on the surface which decreased with depth, profile AWQ1 displayed varying magnetic susceptibility values with depth while, MYG profile indicated a combination of lithogenic and anthropogenic magnetic enhancement. The results of frequency dependence of susceptibility measurement indicated that most of the samples contained a mixture of ultrafine superparamagnetic grains and coarse multidomain magnetic grains as their values varied between 2 and 10%. Profiles AWQ1, AWQ2 and ABF1 are dominated by the presence of ultrafine superparamagnetic grains while only a few samples had completely multidomain characteristics.

Keywords: Magnetic susceptibility, frequency dependence, anthropogenic, lithogenic, superparamagnetic.

28. *Volume 25* (November, 2013), pp 203 – 214

Laboratory Measurements of Electrical Resistivity of Rocks from Girei Local Government Area, Adamawa State, North-Eastern Nigeria.

¹Kanu M. O., ²Meludu O. C., ²Oniku A. S. and ¹Gabriel Ochoche

¹Department of Physics, Taraba State University,
P. M. B. 1167, Jalingo, Taraba State.

²Department of Physics, Modibbo Adama University of Technology,
P.M.B. 2076, Yola, Adamawa State.

Abstract

This paper presents the results of the laboratory measurements of electrical resistivity of fourteen representative surface rock samples from Girei Local Government Area, Adamawa State, part of the Yola arm of the Upper Benue trough, NE Nigeria. The effect of time of water saturation on the

electrical resistivity of these rock samples was also investigated. The purpose was to provide basic data that will be used in the determination of the petrophysical characteristics and electrical conductivity mechanisms of these rocks that will further aid interpretation of down-hole, ground and airborne electromagnetic surveys in the area. The two electrode method was used for the electrical resistivity measurements. Results of the electrical resistivity of the saturated rock samples gave values ranging from 7.485 to $10.690 \times 10^3 \Omega m$ with an average of $8.160 \pm 0.229 \times 10^3 \Omega m$. The preferred orientation of the water wet pores results in low electrical anisotropy values from 1.2:1 to 1.7:1. Results further showed that resistivity decreases with increasing time of water saturation.

Keywords: electrical resistivity, anisotropy, rocks, Girei.

29. *Volume 25* (November, 2013), pp 215 – 220

Assessment of Groundwater Quality in Five Communities in Esan North East LGA of Edo State, Nigeria.

¹*Ezomo F. O., ^{1,2}Biose O., and ²Isiekwe M. U.*

¹Department of Physics,

University of Benin, Benin City, Nigeria

²National Centre for Energy and Environment (Energy Commission of Nigeria),
Benin City, Nigeria.

Abstract

Groundwater exploitation is generally considered as the only realistic option for meeting dispersed rural population water demand. Availability of potable groundwater has been a major problem in Uromi, Esan North East of Edo State. Evaluation of geophysical and chemical characteristics is essential for the development of groundwater resources in the area.

To study groundwater potential in the area, Schlumberger Electrode Configuration and the IP2WIN method of interpretation was adopted. The SAS300B ABEM Terrameter was utilised for the acquisition of data and the global positioning system (GPS) was used to map out various vertical electrical sounding stations in the area. Geochemically, 5 samples of groundwater were taken and subjected to physical and chemical analysis using WHO drinking water standard method. The results from the field and laboratory analysis revealed evidence of pollution from both physical and chemical sources. Five Vertical Electrical Sounding data were acquired in order to evaluate groundwater geophysically within the locations in Uromi. Expectantly, water bearing formations (aquifers) were found in some of the locations such as St. Theresa Catholic Church, Ukoni and Esan Model Boys Grammar School Ubierumum-Oke, with GPS Co-ordinates N06^o 43.019' E006^o 21.470' and N06^o 40.997' E006^o 17.354' at depths of 32.43 meters and 69.90 meters below the earth surface respectively. This study therefore reveals the following: that the selected hand dug wells in Uromi is not safe for consumption because of high nitrite which was above the permissible limits recommended by WHO for drinking water. It was further established that the wells were polluted in areas nearer to farm lands than areas further away from them.

Keywords: Aquifer, Blue Baby Syndrome (BBS), Borehole, Hand dug well, Nitrite, WHO.

30. *Volume 25* (November, 2013), pp 221 – 226

A Search for Aquifers in Crawford University, Faith City, Igbesa, Ogun State.

Usifo A.G. and Akinnawo O.O.
Department of Physics with Electronics,
Crawford University, Km 8, Atan- Agbara Road, Igbesa, Ogun State.

Abstract

A resistivity survey was carried out in order to study groundwater conditions (such as the depth of aquifer) in Crawford University, Faith City, Igbesa. Three (3) vertical electrical soundings using Schlumberger array were carried out at different locations. The Schlumberger resistivity soundings were carried out with half- spacing in the range of 1- 178.00m. The resistivity data were used to determine the depth and nature of the aquifer, and they confirmed that the aquifer in Crawford University is mainly sedimentary.

Keywords: Electrical Resistivity Soundings, Water Formation, Aquifer, Groundwater.

31. *Volume 25* (November, 2013), pp 227 – 238

**A Geoelectric Survey in Cocoa Research Institute of Nigeria (CRIN),
Idi-Ayunre, Ibadan.**

Usifo A. G., Asokhia M. B. and Adeola A. J.

Department of Physics with Electronics,
Crawford University, Km 8, Atan- Agbara Road, Igbesa, Ogun State.

Abstract

A geophysical investigation was carried out in Cocoa Research Institute of Nigeria (CRIN). The method employed in this study was the Vertical Electrical Sounding (VES) using the Schlumberger configuration. The soundings were carried out with half-spacing in the range 1- 100m. The VES points were geo-located using the Global Positioning System (G.P.S.). The co-ordinates of the VES locations lie within latitudes $E003^{\circ} 51' 28.2''$ to $E003^{\circ} 51' 48.7''$ and longitudes $N 07^{\circ} 12' 22.9''$ to $N07^{\circ} 12' 38.3''$. The elevations also range from 129 to 160 metres. The interpretation and analysis of the VES data show that there are suitable aquifers that can be tapped for boreholes.

Keywords: Groundwater, electrical resistivity sounding, aquifer, water formation.

32. *Volume 25* (November, 2013), pp 239 – 250

Groundwater Exploration in Awa-Ijebu, Nigeria, Using the Resistivity Method.

Usifo A. G.

Department of Physics with Electronics,
Crawford University, Km 8, Atan- Agbara Road, Igbesa, Ogun State.

Abstract

A geophysical investigation was carried out in Awa- Ijebu, Nigeria to determine the groundwater potential and the geological structure of the area. The method employed in this study was the Vertical Electrical Sounding (VES) using the Schlumberger configuration. Ten soundings were carried out at different locations. Half- spacing in the range of 1- 100m with the aid of ABBEM TERRAMETER SAS (Signal Averaging System) 3000B and a

booster SAS 2000 manufactured in Sweden was applied. The interpretation of the resistivity curves over the study area within geologic terrain often referred to as basement environment indicates that the area has groundwater potential.

Keywords: Groundwater, electrical resistivity sounding, aquifer, water formation.

33. *Volume 25* (November, 2013), pp 251 – 266

**Solving Assembly Line Balancing Problems:
A Case Study of a Manufacturing Company**

Edokpia R.O. and Okonta C. I.

**Department of Production Engineering,
University of Benin, Nigeria.**

Abstract

Assembly lines are flow-line production systems, where a series of workstations, on which interchangeable parts are added to a product, are linked sequentially according to the technological restrictions. The problem of assembly line balancing is a non-deterministic polynomial-time-hard optimization problem.

This paper utilises three different priority-based heuristics and Genetic Algorithm (GA) in solving assembly line balancing problem. The GA also adopts a fitness function based on realized cycle time and a crossover based on fitness ranking.

The assembly line of a production system was solved using the number of stations, line efficiency and smoothness index as the performance criteria. The objective is to minimise the number of workstations and /or to minimise the cycle time. The existing assembly line having five stations with 74.29% efficiency and a smoothness index of 5 was optimised to four stations with line efficiency of 92.86% and smoothness index of 2.

The results obtained revealed the effectiveness and high efficiency of using this genetic algorithm in solving ALBPs. The suitability in giving optimum solutions to simple assembly line balancing problem (SALBP) results from the robustness and flexibility of the genetic algorithm.

Keywords: Assembly Line Balancing, Heuristic Encoded Genetic Algorithm, Realized Cycle Time.

34. *Volume 25* (November, 2013), pp 267 – 280

**On The Use of Heuristics and Genetic Algorithm For
Solving Line Balancing Problems.**

Edokpia R.O. and Okonta C. I.

**Department of Production Engineering,
University of Benin, Nigeria.**

Abstract

The problem of assembly line balancing is a non-deterministic polynomial-time (NP) - hard optimization problem. Some approximation algorithms for the problem have been proposed but most of them are either not optimal or too complex to apply.

This paper utilizes the combination of longest operation time, ranked positional weight and Kilbridge-Wester heuristics and finally Genetic

Algorithm to solve assembly line balancing problem solved by Ponnambalam et al (2000) in which they used 14 heuristics and GA to solve the ALBP. The GA adopts a fitness function based on realized cycle time and a crossover based on fitness ranking.

The computational effectiveness and efficiency of using genetic algorithm in solving ALBP was validated by comparison with a multi objective genetic algorithm, utilizing fourteen heuristic rules for solving simple assembly line balancing problems.

The three heuristics genetic algorithm was found to perform better, from the view point of optimization giving a line efficiency of 92.59% and smoothness index of 2.45.

Keywords: Assembly Line Balancing, longest operation time technique, Ranked positional weight technique, Kilbridge- Wester heuristic, Genetic Algorithm

35. *Volume 25* (November, 2013), pp 281 – 286

Probability Generating Function and Epidemiology

Osaro Igbiosa

Department of Mathematics,

University of Benin, Nigeria

Abstract

A general Urn model in probability theory is used to handle an illustrative practical problem on the spread of the Human Immune Deficiency Virus (HIV) among Intravenous Drug Users (IVDU) who commonly used hypodermic needles. A probability generating function (pgf) is obtained from which a transition matrix is derived and subsequently used to obtain the expected number of (IVDU) that could be infected with HIV virus when a certain number of heterogeneous hypodermic needles are in circulation.

Keywords: tuberculosis, homotopy analysis method, nonlinear equations, mathematical model, epidemics

36. *Volume 25* (November, 2013), pp 287 – 294

Predicting The Compressive Strengths of Concrete Mixes Made With Washed Local Gravel Using Scheffe's (4,2) Lattice Polynomial

¹*Umeonyiagu Ikechukwu E. and* ²*Onyeyili Innocent O.*

¹**Department of Civil Engineering,
Anambra State University, Uli.**

²**Department of Civil Engineering,
Nnamdi Azikiwe University, Awka.**

Abstract

Most structural failures in Nigeria are due to inadequate strength of the construction materials, mainly concrete. This research seeks to use optimisation techniques to overcome the shortcomings of the laboratory trial mixes of determining concrete strengths. Washed local gravel from Abagana, eastern Nigeria, a major source for the construction industry was used. Based on a design matrix and using these aggregates and river sand, sixty concrete cubes of dimensions 150 mm X 150mm X 150 mm were made, cured

and tested according to the procedures in BS 1881:1983. Scheffe's (4, 2) lattice polynomial with regression equation was used to develop a mathematical model for predicting the compressive strength characteristics of concretes made with these aggregates. A student's t-test was used to test the model's validity and the analysis of variance (ANOVA) carried out.

Keywords: Concrete, Compressive Strength, Scheffe, Local gravel, Model

37. *Volume 25* (November, 2013), pp 295 – 302

On Improved Portfolio Optimization: Alternative Approaches To Covariance Estimation

Alabi Abdulraouv O. and Gbolagade A.W.

Department of Mathematics and Physical Sciences

College of Science, Engineering and Technology

Osun State University, P.M.B 4494 Osogbo, Osun State. Nigeria.

Abstract

Forward looking information is employed in this paper to develop the first, second and third estimators for the covariance of the market returns.

In the performances of the three approaches, it is discovered that the performances show the clear picture of what value the covariance of the market return would have when certain conditions are put into consideration. The introduced constant p has value 0 throughout while constant k has value that ranges from -1 to 1. The three proposed values of k together with the constant value of P give difference values for covariance of market return.

The paper explains further the effect of the value of k at -1 on the covariance of the market return.

Keywords: Optimal portfolio, systematic risk, covariance return, idiosyncratic variance, idiosyncratic error.

38. *Volume 25* (November, 2013), pp 303 – 306

Performance of a Written Matlab Function to an Inbuilt Function for a Set of Examination Scores

Arowolo O. T., Salawu S. O. and Kareem R. A.

Department of Mathematics,

Lagos State Polytechnic, Ikorodu, Nigeria

Abstract

In this work, we write a function which asks the user to enter a set of exam scores. We use MATLAB program to calculate and display the arithmetic mean, standard deviation, median, mode, upper quartile, lower quartile, range and interquartile range of the data. A function $[] = st1(x)$ is defined for the program to calculate these values and the performance of this function is compared with the performance of the inbuilt MATLAB functions.

39. *Volume 25* (November, 2013), pp 307 – 310

Application of Softmultiset in Decision Making problems

Ibrahim A. M. and Balami H. M.

Department of Mathematics,

Ahmadu Bello University, Zaria, Nigeria

Abstract

The theories of softmultisets are important mathematical tools to handle uncertainties about vague concepts. In this paper we present basically the application of softmultiset theory in decision making problems with the help of the redefined softmultiset that maps the set of parameters to the power multiset and not to power whole multiset.

Keywords: Softmultiset, Reduct-Softmultiset, Choice value, Multivalued Information System, tabular representation.

40. *Volume 25* (November, 2013), pp 311 – 320

Criterion for Choosing Among Alternative Competitive Models for

Assessing the Fit of Regression Models

¹*Osemeke R. F.,* ²*Efeizomor R.O* and ³*Azagbaekwue A.*

^{1,3}**Department of Mathematics,**

College of Education, Agbor, Delta State.and

²**College of Education, Agbor, Delta State**

Abstract

Several statistical measures such as Mallows C_p statistic, coefficient determination r^2 , adjusted r^2 , standard error of estimates and forward stepwise regression are used as a criterion for the selection of best subsets regression models in a multiple regression analysis. The best subset fitted models are selected among competitive models based on C_p statistic $\leq (P + 1)$ which means a small biased, the highest value of adjusted r^2 , highest value of r^2 , lowest value of standard error of estimates, low bivariate correlation among the predictors. The predictors X_3 (PARKING) and X_5 (INCOME) was removed from the model due to non significant effects. The selected best fitted model through studentized residuals (STR) against the predicted value (\hat{y}) are used to evaluate the aptness of the fitted model. The model X_4 (SHOPCNTR) demonstrate some anomalous features and was improve upon by log transformation. The final fitted model was

$Y_i = 37.82 - 0.0021X_1 - 0.531X_2 + 0.10X_4$. With iteration method of outlier detection, row 5, row 7 and row 18 of Table 8 was removed from the model because each of the value for standardized residuals is outside the range of 2 x standard deviation or -2 x standard deviation. At each evaluation process, there was a greater improvement in the regression coefficient. The standardized residuals, leverage points, and studentized residuals of Table 8 were used to detect outliers as influential. For studentized residuals, any value that exceed +2(up) and -2(down) are regarded as an outlier. The average leverage value is $\frac{p}{N}$, where p is the number of predictors (the number of coefficients plus one for the constant)

and n is the sample size. Leverage point greater than $\frac{2k+2}{n}$ should be carefully examined.

Keywords: Best Subset Analysis; Stepwise Estimation; Correlation Matrix; Optimal Model; Residual Plots; Outliers

41. *Volume 25* (November, 2013), pp 321 – 332

Design, Implementation and Simulations of Digital Voting Machine Using Full Adders and Parallel Binary Adders

Galadanci G. S. M., Bello M. I. and Gana S. M.

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

Abstract

In this work, a digital voting machine was designed, implemented and simulated. The design was carried- out using 4- bit parallel binary adders (74LS283) and full adders. It is simple electronic voting system that can be used to simultaneously provide the number of "yes" votes and the number of "no" votes. It can be used where a group of people are assembled and there is a need for immediate determination of opinions (for or against), making decisions, or voting on certain issues or other matters. The system includes switches for "yes" or "no" selection at each position in the assembly and digital display for the number of "yes" votes and one for the number of "no" votes. The system was designed to accommodate total of twenty four members of the assembly with possible increase to higher number. It was implemented and simulated on national instrument software 'multisim' version 11.0. It was tested and found to be working as designed.

Keywords: tuberculosis, homotopy analysis method, nonlinear equations, mathematical model, epidemics

42. *Volume 25* (November, 2013), pp 333 – 338

Application of Ant Colony Optimization Algorithm to Solve Travelling Salesman Problem

Amiolemhen P.E. and Haruna J. I.

**Production Engineering Department,
Faculty of Engineering, University Of Benin,
P.M.B 1154, Benin City, Nigeria.**

Abstract

This paper addresses the optimization of a Traveling Salesman Problem (TSP) using the Ant Colony Optimization algorithm to find the optimal tour distance or minimal distances between cities. Ants of the artificial colony are able to generate successively shorter feasible tours by using information accumulated in the form of a pheromone trail deposited on the edges of the TSP graph.

To test the performance of the proposed method, a six-city symmetric TSP problem is solved using the data collected for the city-city distances. The implementation of the algorithm was done using the C++ programming

language and the experimental results show a great effectiveness when the TSP problem is solved with the colony optimization algorithm.

Keywords: Ant colony optimization; Travel salesman problem (TSP); optimal tour distance, pheromone, Tabu list

43. *Volume 25* (November, 2013), pp 339 – 352

Design Implementation and Simulation of a 4-Bit Decimal Adder using Parallel Binary Adders and BCD Encoders

Galandanci G. S. M. and Gana S. M.

Physics Department,

Bayero University, P.M.B 3011 Kano.

Abstract

In this work a 4-bit decimal adder was designed, implemented and simulated. The decimal addition is carried out using Binary Coded Decimal (BCD) addition and a 10-line to 4-line encoder was upgraded to 15-lines to 4-lines and was used to convert each decimal digit to its corresponding BCD code. A 4-bit parallel adder with fast carry (74HC283), and additional circuitry of AND gate and OR gates were interconnected to carry out the BCD addition. A BCD to seven segment display converter (DCD Hex) was used to convert and displayed the generated sum in BCD to decimal. The designed system was implemented and simulated on circuit simulation software (National instrument multisim version 11). The system is tested and found to be capable of performing addition of any two 4-bit decimal numbers.

Keywords: tuberculosis, homotopy analysis method, nonlinear equations, mathematical model, epidemics

44. *Volume 25* (November, 2013), pp 353 – 362

Design and Development of a GSM Phone Jammer

Otasowie P. O. and Chukwunomnazu E. H.

Department of Electrical and Electronic Engineering,
University of Benin, Benin City, Nigeria.

Abstract

This paper presents a design and development of a Global System for Mobile Communication (GSM) Phone Jammer. It is developed for the purpose of neutralizing network signal from GSM network.

The developed circuit of the GSM Phone Jammer consist of power supply stage, the signal generation stage, the radiofrequency tuned inductance capacitance oscillator stage and the radiofrequency amplifier stage. The developed circuit was realized by the use of a high frequency transistor in designing the radiofrequency (RF) tuned inductance capacitance (LC) oscillator that generates GSM band carrier frequency modulated with noise. The modulated carrier wave/frequency (jammer signal) is amplified by an external antenna that transmits the modulated wave into space.

The circuit was designed, constructed, tested and found to perform satisfactorily as it was able to jam four GSM networks of MTN, Airtel,

Etisalat and Globacom. The circuit cost was N5,500 which is reasonably not very expensive to afford.

Keywords: GSM phone, jammer, network operator, frequency band.

45. *Volume 25* (November, 2013), pp 363 – 376

BTS Power Consumption Cost Reduction Using Solar PV System in Nigeria

¹*Ezomo, P. I. and* ²*Otasowie P. O.*

¹Department of Electrical/Electronic and Computer Engineering.

Igbinedion University. Okada. Edo State.

²Department of Electrical/Electronic Engineering.

University of Benin, Benin City.

Abstract

This paper presents solar photovoltaic (PV) system as the cheapest means of powering base transceiver station (BTS) in Nigeria. There are many schemes that can be used to provide power to BTS. They include solar photovoltaic (Solar PV) system, Diesel generator, Power Holding Company of Nigeria (PHCN) and Batteries. In Nigeria many base transceiver stations (BTS) are provided power with diesel generators because PHCN (National grid) supply is very epileptic and unreliable. This makes the cost of Global System for Mobile Communication (GSM) services to be very high.

The methodology used in this work was to visit a certain GSM base station in Benin City, Edo State of Nigeria to obtain information on the type of equipment located in the Base Station and their load demand. The daily power outage of the base station was recorded daily for six months from May to October 2011

These data were analysed and the cost of powering the base station with solar PV system and diesel generator were compared. It was found that the cheapest means of powering a base transceiver station is power supplied by solar photovoltaic system at a cost of N46767160:00.

Keywords: Solar photovoltaic system, diesel generator, base transceiver station power outage, load demand.

46. *Volume 25* (November, 2013), pp 377 – 384

An Overview of Battery Guiding Principles and Selection

¹*Akpojedje F. O.,* ²*Egedi-idu S. O. and* ³*Onogbotsere M. E.*

¹London Tech Global Ventures, Ughelli Delta State Nigeria.

²Delta State Unified Local Government Commission, Delta State Nigeria.

³Department Electrical/Electronic Engineering,
Delta State Polytechnic, Oghara Delta State Nigeria.

Abstract

Batteries are typically the last resort or line of defense against total shutdown during power outages. Experience shows that failures in storage batteries can cause more down time and service calls on emergency system than other equipment's in the system. The aim of this paper is to present the

principles of batteries operation, selection and maintenance for good performance and longevity. In this paper, principles guiding battery usage and as well as the maintenance are highlighted. Load test was carried out on 12v VRLA battery to test the performance and the reliability of the storage battery for efficient back-up supplies. It was found out that discharging the battery beyond the manufacturer voltage specification causes the battery voltage to decline rapidly. Hence, the end – users should adhere to the information provided for proper batteries selection and also, adhering to manufacturer's specification for maximizing the batteries efficiency and longevity.

47. *Volume 25 (November, 2013), pp 385 – 394*

**Impact of Power Factor Correction on Energy Saving in Nigeria
Power System – A Case Study**

¹Akpojedje F. O., ²Onogbotsere M. E. and ³Egedi-idu S. O.

¹London Tech Global Ventures, Ughelli Delta state Nigeria.

²Department of Electrical/Electronic Engineering,
Delta State Polytechnic, Oghara, Delta State Nigeria.

³Delta State Unified Local Government Commission, Delta State Nigeria.

Abstract

The Nigeria power system has been undergoing several policy changes over the years in order to improve the power system and also to ensure increase in capacity and efficient electricity supply to Nigerians. However, these laudable goals are yet to be achieved and the small megawatts that Nigeria generates is wasted by high reactive loads in many industrial sectors today by operating on low power factor. The aim of this research paper is to demonstrate the impact of power factor correction on energy saving in Nigeria power system. It was realised by installing power factor correction device (PFC) in some selected consumer's premises and field measurement was carried out before and after the PFC installation. Data were recorded during the operating hours of the selected factory site. Conclusively, it was shown that the power factor of the selected factory site was improved from 0.7 to 0.97, thereby increasing the KVA capacity of the electricity supplying transformer by 27.84%. The analyses of the results shows that the PFC device have the ability to reduce the system losses, improve the capacity and the efficiency of the system without installing additional cables and transformers, thereby saving energy for Nigeria.

48. *Volume 25 (November, 2013), pp 395 – 400*

Investigation into Thermal Emittance of Solar Assisted Electroless Deposition of Cadmium Sulphide Thin Films for Different Deposition Times at 40⁰C

¹Amen-Leleji, A. O., ²Damisa, J and ²Ilenikhena, P. A.

¹Department of Physics, College of Education,
Ekiadolor, Benin City. Edo State, Nigeria

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

Abstract

Thin films of cadmium sulphide were successfully deposited on polished aluminium sample plates by solar assisted Electroless Chemical Deposition (ECD) method at ambient temperature of 40°C. The thermal emittance of the sample plates were measured using an emissometer before and after deposition of the thin films. The average thermal emittance value of the polished plates was 0.10±0.01 while the thermal emittance value of the coated plates ranged from 0.21 to 0.24±0.01 depending on the deposition time. The film thickness of the coated sample plates value ranged from 1.273 to 6.825µm ±0.001. The low thermal emittance value of the coated plates compare favorably with spectrally selective surfaces used in solar collectors.

Key words: Thermal emittance, Emissometer, Electroless Chemical Deposition Method , Thin films, Film thickness, Aluminium .

49. *Volume 25* (November, 2013), pp 401 – 408

Potential of Rice husk ash for removal of phenol in aqueous solution.

¹Kangpe N. S., ¹Alemika D.Y., ¹Egga E. S., and ²Marti D. M.

¹Department of Chemistry,

University of Jos, P.M.B. 2084, Jos.

²College of Education Azare, Bauchi State.

Abstract

The pollution of water with phenol from chemical industries is a highly important environmental problem because of the propagation of the pollution and its unfavorable consequences to life. The potential of rice husk ash for the removal of phenol from aqueous solution was investigated in a batch process. Isothermal studies were carried out under different experimental conditions of contact time, adsorbent dose and initial phenol concentration. The suitability of the Freundlich and Langmuir adsorption models to the equilibrium data were also investigated for each phenol-adsorbent system. The result showed high efficiency of rice husk ash for phenol removal and also the data for the phenol-adsorbent systems fit the Freundlich model best within the concentration range studied. It can be inferred that rice husk ash can be used as a low cost adsorbent for phenol removal from aqueous solution.

Keywords: Adsorption, rice husk ash and phenol

50. *Volume 25* (November, 2013), pp 409 – 412

Thermal Rating of Nigerian Made Bare Overhead Aluminium Conductors

¹Adenodi R. A., ²Iwetan C. N., ¹Akinwale B. F., ¹Ijila P. O., ³Akinluyi F. O. And ¹Akinnubi

Rufus

¹Department of Physics, Adeyemi College of Education, Ondo.

²2-953 Summerside Ave. Winnipeg, MB. Canada.

³Department of Remote Sensing and Geographical Information System,
The Federal University of Technology, Akure, Nigeria.

Abstract

The increase in demand for electrical energy is growing while the available overhead aluminium cables which are the means for distribution of electrical energy are losing quality due to increase in the temperature of the ambient resulting from use and global warming. To meet the growing demand for electrical energy, the thermal ratings of existing overhead cables must be calculated for the purpose of making improved ones that can withstand the prevailing weather conditions. Increasing the current density, under the existing ambient condition of increased temperature due to global warming, has increased the lines' temperature beyond operating limits and therefore sagging, reduction in tensile strength, breaking of lines and violation of ground clearance are the attendant consequences. In this study, thermal ratings of overhead aluminium cables were estimated using the steady-state heat balance. The results reveal the need for quality improvement in overhead aluminium cable for satisfactory distribution of electrical energy in Nigeria.

Keywords: ground clearance, conductor temperature, aluminium cables.

51. *Volume 25* (November, 2013), pp 413 – 416

Mathematical Solution to the Problems of Productivity in Nigeria

Nneji, S. O.

Department of Physical Sciences

Evangel University, Akaeze, Ebonyi State, Nigeria.

Abstract

This study unveils how linear programming techniques (a mathematical optimization strategy) can be used to improve productivity. When productivity improves, profit appreciates, hence employment opportunities will naturally be created. Linear programming technique as portrayed in this paper, is a veritable tool for facilitating critical and rational decision making. Undoubtedly, managers of Nigeria's and other nations' economies at various stages are faced with daily challenges to choose between competing alternatives. Decision making process becomes more technical when certain constraints pose as obstacles. Incidentally, that is when linear programming techniques become more useful. It was recommended in this paper therefore that managers, administrators and leaders generally should be trained in the use of linear programming techniques or at least they should be encouraged to employ mathematicians who are good at modeling linear programming techniques and other mathematical optimization strategies as special advisers.

52. *Volume 25* (November, 2013), pp 417 – 424

A Class of Block Hybrid Methods with Continuous Coefficients for Stiff Initial Value Problems in Ordinary Differential Equations

Kumleng G. M. and Longwap S.

**Department of Mathematics,
University of Jos, P.M.B. 2084, Jos, Plateau State, Nigeria**
Abstract

A class of block hybrid methods (BHMs) based on the Generalized Adams methods for step numbers three and five with one off step point each is presented in this paper for the solution of stiff ordinary differential equations (ODEs). The construction of these block methods is based on the approach of collocation and interpolation. These methods are A-stable, a basic requirement of linear multistep methods for the solution of stiff problems. Numerical results of experiments conducted using the BHMs and their conventional counterpart of the same step size reveals the superiority of the BHM over their conventional ones especially in the case of the three step BHM.

Keywords: Initial value problems, Ordinary Differential equations, Block Hybrid methods

53. *Volume 25* (November, 2013), pp 425 – 438

New Iterative Schemes for Solving Nonlinear Equations

¹Ndayawo M. S. and ²Sani B.

¹Department of Mathematics, Statistics and Computer science,
Kaduna Polytechnic, Kaduna Nigeria

²Department of Mathematics,
Ahmadu Bello University, Zaria, Nigeria

Abstract

In this paper, we present two new iterative schemes for solving problems of nonlinear equations from the classical Taylor's series method. The methods are constructed by applying the Adomian decomposition method and are compared with other iterative methods using a two way analysis of variance (ANOVA). They were found to be very efficient and better than some of the existing schemes. Some numerical examples are given to justify the efficiency of the new iterative schemes.

Keywords: Nonlinear equations, iterative methods, Adomian decomposition method.

54. *Volume 25* (November, 2013), pp 439 – 444

Heat Flow in a PTC Thermistor with an Exponential Function Conductivity

¹Durojaye M. O. and ²Agee J. T.

¹Department of Mathematics,
University of Abuja, PMB 117, Abuja, Nigeria

²Department of Electrical Engineering,
Tshwane University of Technology, Pretoria,
Private Bag X680, Pretoria 0001, South Africa.

Abstract

The mathematical model for the description of heat conduction in a thermistor is a coupled system of nonlinear partial differential equations. This paper is on the numerical solution of this model with an exponential function electrical conductivity with a view to analyse the flow of heat in the device. Numerical results are found to be in good agreement with existing results and represent physical characteristics of the thermistor.

55. *Volume 25* (November, 2013), pp 445 – 450

A Method of Lines Solution of Reaction Kinetics Model of Polymerization in The Presence of Material Diffusion

¹*Durojaye M. O. and* ²*Olayiwola R. O.*

¹Department of Mathematics,

University of Abuja, Abuja. Nigeria

²Department of Mathematics,

Federal University of Technology, Minna

Abstract

This paper is on the semianalytical method of lines solution of reaction kinetics model of polymerization in the presence of material diffusion. The approach is to reduce the model partial differential equation to a vector system of ordinary differential equations and solve using standard methods for ordinary differential equations. Using this method we obtained temperature profiles for $p = 1, 2, 3$ and the time dependent behavior of temperature for all the cases.

Keywords: Method of lines, Ode 15s.

56. *Volume 25* (November, 2013), pp 451 – 458

Real - Time Voltage Stability Improvement in Electric Power Transmission Network

Ike S. A. and Egwaile J. O.

Department of Electrical/Electronic Engineering

University of Benin, Benin City. Nigeria

Abstract

Enhancing real-time voltage stability in power system transmission network by reactive power compensation is presented in this work. The Nigerian 330kv transmission network system was used as a case study. Power flow for the network was studied and analysed in Matlab and Power System Analysis toolbox (PSAT). Total of 27 buses, 40 transmission lines and 7 generating stations of the network were considered. The base generated power were [2464.777 MW],[-1374.6861 MVar] and base load were [2381.2445 MW], [1520.9009 MVar]. The bus voltages at the base load, 120 and 125 percent of the base load without an increase in generation level were determined during the power flow simulation. At the base load, voltage recorded at Gombe, Kano and Jos buses were 0.91494 Vpu, 0.95112 Vpu and 0.95774 Vpu respectively. While at 120 and 125 percent of the base case load, voltage recorded at Kano were 0.9338Vpu and 0.9276Vpu respectively.

Minimum voltage violation (Voltage Dip) were recorded at Gombe and Kano buses. Reactive compensation devices (Capacitive) were applied at these buses with voltage dip and re-simulation of power flow study showed that the bus voltages at Gombe, kano and Jos came up to 0.99132Vpu, 0.98312Vpu and 0.96764Vpu respectively.

57. *Volume 25* (November, 2013), pp 459 – 462

Numerical Methods for Solution of Initial Value Problem Using Sylvester's Sequence and Egyptian Fractions

¹*Adeboye K. R. and* ²*Odio A. O.*

¹Department of Mathematics/Computer Science,
Federal University of Technology, Minna.

²Department of Mathematics,
University of Nigeria, Nsukka.

Abstract

Sylvester's Sequence and Finite Egyptian Fraction seem to be uniformly, rapidly decreasing values of fractions which converge to the unit number one. We examine and utilize this property to develop numerical methods for the solution of initial value problems.

Keywords: Sylvester's sequence, Egyptian fractions, initial value problems, finite linear multi-step scheme, convergence, zero stability and consistency

58. *Volume 25* (November, 2013), pp 463 – 466

Computational results of Advection equation using FTBS scheme.

Odio, Augustine. O

Department of mathematics,
University of Nigeria, Nsukka

Abstract

We consider the one dimensional equation that governs the motion of a conserved scalar as it is advected by a known velocity field. We use the FTBS or forward in time and backward in space scheme for the Advection equation. If expanding the numerical scheme by Taylor series expansion and truncating it after the first two terms, we found that, the discretized equation satisfied the partial differential equation. A further result that admits the theorem of Lax, shows that the numerical properties of consistency, stability and convergence are satisfied.

Keywords: Advection equation, numerical scheme, Damped radio wave, constant velocity, consistency, stability, convergence and Lax theorem.

59. *Volume 25* (November, 2013), pp 467 – 470

**On a Modified Variational Iteration Method for the Analytical Solution
of Korteweg-de-Vries Equation**

Olayiwola M. O.

**Department of Mathematical & Physical Sciences
Faculty of Basic and Applied Sciences
College of Science, Engineering & Technology
Osun State University, Osogbo, Nigeria.**

Abstract

In this paper, a new analytical technique known as Modified Variational Iteration Method (MVIM) for the solution of Korteweg-de-Vries equation is presented. Numerical examples are tested to illustrate the efficiency, reliability and pertinent feature of the proposed method.

Keywords: Korteweg-de-Vries, modified variational iteration method, lagrange multiplier, Taylor's series, partial differential equation.

60. *Volume 25* (November, 2013), pp 471 – 474

A New Approach to the Solution of the Nonlinear Klein-Gordon Equation

¹*Olayiwola M. O.,* ²*Akinpelu F. O. and* ¹*Gbolagade A. W.*

¹**Department of Mathematical & Physical Sciences
Faculty of Basic and Applied Sciences
College of Science, Engineering & Technology
Osun State University, Osogbo, Nigeria.**

²**Department of Pure and Applied Mathematics
Faculty of Pure and Applied Sciences
Ladoke Akintola University of Technology
Ogbomoso, Nigeria**

Abstract

We present a new Modified Variational Iteration Method (MVIM) for the solution of nonlinear Klein-Gordon equations. This method is an elegant combination of the successive Taylor's approximation and the Variational Iteration Method (VIM). Numerical results show the complete reliability of the proposed technique.

Keywords: Klein-Gordon, modified variational iteration method, lagrange multiplier, Taylor's series, partial differential equation.

61. *Volume 25* (November, 2013), pp 475 – 476

A Case In Favour of the Ejection Hypothesis for Planetary Formation

Bakwa D. D. and Howusu S. X. K.

**Department of Physics,
University of Jos, P. M. B. 2084, Jos, Plateau State, Nigeria**

Abstract

One of the great enigmas in Physics today is the fact that in spite of man's scientific and technological discoveries he is yet to understand how the planets in the Solar system were formed. Therefore several theories of planetary formation have been advanced and studied over the years. In this paper we make a case for the Ejection Hypothesis based upon the well established Principle of Conservation of Mechanical Energy.

62. *Volume 25* (November, 2013), pp 477 – 480

Einstein's Equations of Motion in a Flat Oblate Spheroidal Space-Time

Bakwa D. D., Jabil Y. Y. and Howusu S. X. K.

Department of Physics,

University of Jos, P. M. B. 2084, Jos, Plateau State, Nigeria.

Abstract

It is well known how to formulate and solve Einstein's equation of motion in the fields of bodies having cylindrical and spherical symmetries. But, the fact of nature is that astronomical bodies such as the Earth and sun are generally spheroidal in geometry. Therefore in this paper we derive the Einstein's equations for flat space-time in oblate spheroidal coordinates to pave the way for the investigation of the corresponding equations in the fields of bodies having spheroidal geometries.

63. *Volume 25* (November, 2013), pp 481 – 486

A Framework for an e-CRM Customer Segmentation

Egbokhare F. A and Oliha F. O.

Department of Computer Science

University of Benin, Benin City, Edo State, Nigeria.

Abstract

The Customer is an important resource in every organization since they are responsible for generating profit, hence in recent times, most organizations have engaged in management frameworks to attract and retain customers. To be able to achieve this goal, this research therefore employed a segmented approach towards addressing the challenges organizations face in managing customers. A segmentation system was designed and implemented for classifying customers who share common characteristics into distinct customer segments. Using the segmentation system, we were able to group customers using data gathered from Internet users within the University of Benin community, thereby providing a platform for an in-depth understanding of customers' perception with regards to service needs and usage patterns.

Keywords: Customers, segmentation, CRM, e-CRM.

64. *Volume 25 (November, 2013), pp 487 – 490*

Higher Order Nonsingular Immersions of Dold Manifolds.

Okogun, E. Augustine and Onose, G. Moses

Department of Mathematics,

Delta State College of Physical Education, Mosogar.

Abstract

In this paper we employ β – operations and characteristic classes to study nonexistence of higher order nonsingular immersions of Dold manifolds into a Euclidean space.

65. *Volume 25 (November, 2013), pp 491 – 498*

The Development of Nuclear Technology: The Benefits, Risk and Protection

Michael Emuerhi

**Petroleum and Natural Gas Processing Dept (PNGPD),
Petroleum Training Institute, Effurun-Warri, Delta State.**

Abstract

There is no doubt now, that energy crisis, is the major problem confronting developing Countries and yet, these countries had continued to embark on and nurture a no-growth Program of energy supply such as Mini-Hydro, Thermal, Solar, Wind Power etc. Hence, there is over-dependence on Industrialized Nations for the supply of essential goods and services and worse to the quality of life. This research work is meant to create an awareness of alternative and sustainable source of energy supply such as Nuclear Electricity, too cheap to meter. Uranium, which is the fuel used in Nuclear Power Stations, is available in large quantities throughout the world.

The study delves into the mechanisms of Nuclear Reaction, Radioactive Substances, Radioactive Isotopes, and peaceful application of Nuclear Science, production of Nuclear Electricity, risk and protection.

A practical approach was also adopted, aimed to galvanize readers' interest towards Nuclear Electricity generation and enormous potentials offered by Nuclear Science.

66. *Volume 25 (November, 2013), pp 499 – 508*

Supergravity Coupling, Field Breaking and Restoration of Gauge Invariance

¹Onuche A. P and ²Obagboye L

¹Department of Mathematics and Statistics,

University of Uyo, P.M.B 1017 Uyo, Akwa Ibom

²School of Theoretical Physics,

National Mathematical Centre, P.M.B 118 Sheda, Abuja

Abstract

In this paper $d = 10, N = 1$ Yang-Mills system is coupled to $d = 10, N = 1$ supergravity. We give a critical analysis of the current, low dimension auxiliary fields, and reveal the existence of two ordinary axial. Maxwell-Einstein current agrees with the Noether coupling. The coupling of the photon A_μ to anti-symmetric tensor is consistent following Maxwell transformation $\partial A_\mu = \partial_\mu \wedge$ extended to $\partial A_{\mu\nu} = K \wedge F_{\mu\nu}$.

Keywords: supergravity, gauge invariance, gauge algebra, supersymmetry, auxiliary fields

AMS subject classifications: 83E50, 70S15, 81T13, 53C07, 58E15, 81T60

67. *Volume 25* (November, 2013), pp 509 – 520

A note on Ricci Flow on Closed Surfaces M^2 with $\chi(M^2) > 0$

¹*Abimbola Abolarinwa and* ²*Lawal O. Waheed*

¹School of Mathematical and Physical Sciences,

University of Sussex, UK

²Department of Mathematics,

Tai Solarin University of Education, Ijagun, Nigeria

Abstract

We describe the process of flowing 2 closed surfaces by the Ricci flow and make some remarks when the Euler characteristic $\chi(M^2)$ of the surface is positive. Indeed, either the round 2-sphere, S^2 or its Z_2 quotient, RP^2 is the only gradient shrinking Ricci Soliton. As a by product, we obtain differential Harnack estimates on positive solutions of conjugate heat equation defined on a surface with nonnegative scalar curvature.

Keywords: Ricci soliton, Monotonicity Formulae, Einstein metric, Kazdan-Warner Identities, Uniformization Theorem.