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Mathematical Modeling of Reverse Osmosis Process by the Orthogonal Collocation on Finite Element Method

Belkacem Absar, Sid El Mahi Lamine Kadi and Omar Belhamiti

A simplified model is used to predict the performance of hollow fiber reverse osmosis membrane. The model is based on the solution-diffusion mass transfer model and takes into account the effect of the flow pattern of the permeate in the membrane. Two types of flow pattern can be distinguished: the co-current and counter-current flow pattern. The resolution of the mathematical model developed for the counter-current flow pattern is subject to the Boundary Value Problems (BVP). A convenient computational method is used to solve BVP using orthogonal collocation on finite elements. This method is the conjunction of Finite Element Method (FEM) and Orthogonal Collocation Method (OCM). OCM discretize BVP's conveniently where as FEM provides accuracy to the solution. The model is verified using experimental data from literature. Co-current and counter-current flow operations are compared using parameters of overall recovery, average product concentration and final feed concentration in closed loop process. The simulation results show that the operating time in the case of counter-current flow is longer than that of the co-current flow. Thus, the overall recovery is higher. These results show clearly the better efficiency of the counter-current flow pattern in the concentrating process. *(Asian Journal of Applied Sciences 1 (1): 1-18, 2008; Doi:10.3923/ajaps.2008.1.18)*

Effect of Glass Fibre Reinforced Polymer Reinforcements on the Flexural Strength of Concrete One Way Slabs under Static and Repeated Loadings

R. Sivagamasundari and G. Kumaran

The purpose of this experimental study is to investigate the flexural behaviour of concrete one way slabs reinforced with Glass Fibre Reinforced Polymer (GFRP) reinforcements as well as conventional (Steel) reinforcements when subjected to static and repeated loadings. A total number of forty slabs of size 2.4×0.6 m were cast, out of which twelve slabs were reinforced with steel reinforcements and the remaining slabs were reinforced with GFRP reinforcements. Twenty numbers of slabs were tested under static loading condition and another twenty numbers of slabs were tested under repeated loading condition. Various parameters like types of reinforcements, longitudinal reinforcement ratio, grade of concrete and thickness of slabs were used in the construction of slabs and the results were analyzed. This

research had been restricted with the observation of number of load cycles applied to the slab specimen up to failure, deflection characteristics, crack width and number of cracks developed. From the fatigue results, S-N curve was drawn. It was observed that the fatigue response of sand coated GFRP reinforced slabs is superior to all the other types of slabs. *(Asian Journal of Applied Sciences 1 (1): 19-32, 2008;* ***Doi:****10.3923/ajaps.2008.19.32)*

Design of Intelligent Controller for Non-Linear Processes

S. Nithya, Abhay Singh Gour, N. Sivakumaran, T.K. Radhakrishnan, T. Balasubramanian and N. Anantharaman

The aim of this research is to discuss the control issues associated with the non-linear systems in real time using cost effective data acquisition system. The non-linear systems taken up for study are conical and spherical tank. System identification of these nonlinear processes are done using black box model, which is identified to be non-linear and approximated to be a First Order Plus Dead Time (FOPDT) model. In this study, for designing the controllers, we have taken Proportional Integral (PI) controller using Skogestad tuning rule, Fuzzy Logic Controller (FLC) using both Mamdani (M-FL) and Takagi-Sugeno (TS-FL) models are developed for controlling the non-linear processes using MATLAB with ADAM's data acquisition module. The performance comparison of the controllers are compared based on performance indices like Integral Squared Error (ISE) and Integral Absolute Error (IAE). The real time implementation of the results, shows that the TS based FL produces improved control performance the Mamdani fuzzy and conventional controller. *(Asian Journal of Applied Sciences 1 (1): 33-45, 2008;* ***Doi:****10.3923/ajaps.2008.33.45)*

Blood Flow in Uniform Planar Channel

A.M. Sobh and H.A. Abu Oda

In this research, we investigate the peristaltic flow of blood through a planar channel of uniform thickness. Blood is represented by a micropolar fluid (a fluid can support coupled stresses, body couples and exhibit microrotational and microinertial effects). The problem is formulated and solved without any restrictions on the wave ratio and the Reynolds number. Perturbation method in terms of wave number (δ) as a parameter is used to obtain analytic form for the axial velocity, the microrotation velocity and the pressure gradient to the first order. Moreover, the pressure rise and friction force have been computed

numerically and the results are studied for various parameters of interest.

Robust Feedback linearization and Observation Approach for Control of an Induction Motor

O. Asseu, M. Koffi, Z. Yeo, X. Lin-Shi, M.A. Kouacou and T.J. Zoueu

This study presents a feedback linearization strategy and a robust controller to permit a decoupling and regulation of the motor states in order to assure a good dynamic performance and stability of the global system. As the control required the knowledge of the instantaneous flux of the rotor and the rotor parameter estimation can improve the control quality, a six-dimensional discrete-time extended sliding mode observer is proposed for on-line estimation of rotor fluxes and rotor time constant. The simulation results for a 1.8 kW induction motor are presented to illustrate the validity and the high robustness of the proposed approach against parameter variations and disturbances.

Analytical and Numerical Simulation of Temperature Field and Residual Stresses of Butt Weld in Steel Plates used in Ship Manufacturing

Mehdi Iranmanesh and Armin Rahmati Darvazi

A calculating process for analyzing temperature field and residual stresses in the butt weld in steel plates used for ship manufacturing has been presented. Present study is based on software ANSYS 9.0 and includes 3-dimensional uncoupled heat-mechanical model and analytical field stress 2-dimensional model using programming software MATLAB 7.1 and the method of advanced elastic. The model of finite element was used in order to evaluate temporary stresses and residual stresses of the weld. At first, 3-dimensional model is developed in order to study temperature field and residual stresses. Then 2-dimensional model was used in order to study temperature cycle and welding residual stresses. Using the 2-dimensional model can save in much time of calculation. In this research testing results of reference were used to show accuracy of models. The results of both 2 and 3-dimensional models are very good considering the test model.

Effect of Vacuum Dewatering Application on the Chemical Corrosion and Mechanical Properties of Concrete

Emre Sancak

In this study, reference concrete slab, which its height is 15 cm and size is 200×600 cm, a concrete slab to be exposed to vacuum for 35 min (full vacuumed) with size of 300×400 cm and a concrete slab vacuum-processed for 18 min (semi-vacuumed) with size of 300×400 cm were produced. Compressive strength tests were performed on core specimens taken from these three concrete slabs on 7th, 28th and 1080th (36th month) days and tensile strength test was performed on 1080th (36th month) day. Carbonation depth test was performed on the core specimens produced was investigated. Carbonation depth and Cl^- ion determination were tested on powder samples from these core specimens. Test results have shown that vacuum dewatering to concrete increased its resistance to long term chemical corrosion and also improved its mechanical properties. *(Asian Journal of Applied Sciences 1 (1): 79-86, 2008; Doi:10.3923/ajaps.2008.79.86)*

Physicochemical Analysis of Drinking Water in Kohdasht City Lorestan, Iran

A. Jafari, H. Mirhossaini, B. Kamareii and S. Dehestani

This study consisted of the determination of some physiochemical properties in drinking water samples from the Kohdasht region of the Lorestan, Iran, where drinking water sources are ground water. The purpose was to ascertain the quality of water from these sources. Samples were taken from sixteen sampling points and analyzed for the following parameters, Ca, Na, K, Mg, Mn, NO_3^-, NO^-, SO_4^{2-}, PO_4^{3-}, F^-, Cl^-, TDS, EC, alkalinity, hardness and turbidity using the procedure outline in the standard methods. The data showed the variation of the investigated parameters in samples as follows: pH 7.5-7.76, Electrical Conductivity (EC) 705.67-976 μS cm^{-1}, turbidity 0.1-0.4 NTU, PO_4^{3-} 0.11-0.31 mg L^{-1}, NO_3^- 11.44-41.36 mg L^{-1}, NO_2^- 0.017-0.514 mg L^{-1}, SO_4^{2-} 44-90 mg L^{-1} and Mn 0.002-0.056 mg L^{-1}. The concentrations of most of the investigated parameters in the sources of drinking water samples from Kohdasht region were within the permissible limits of the World Health Organization drinking water quality guidelines. *(Asian Journal of Applied Sciences 1 (1): 87-92, 2008; Doi:10.3923/ajaps.2008.87.92)*

Bi-Hierarchical Finite Element for the Analysis of the non Axisymetric Free Vibration of Shells of Revolution

Mohammed Nabil Ouissi and Abderrahim Houmat

A new hierarchical finite element is developed to analyze the free vibration of isotropic shells of revolution with linear varying thickness. It is a bi-hierarchical four nodes quadrilateral element with three degrees of freedom (three displacements) by node. The specificity of this element is a double increase of the hierarchical mode number independently according to both axial and radial directions. The advantage is that the solution is accurate for high ratio dimensions as well flattened axisymmetric (plates) shells that slim ones (high cylindrical shells) with different shapes and boundary conditions. The second advantage is the possibility of using only one element to idealize regular shape shells. Through the application of this element to some numerical examples, the comparisons with other studies show clearly that this element gives good results accuracy with simple idealization for axisymmetric and non-axisymmetric shells vibration (thick and thin). *(Asian Journal of Applied Sciences 1 (2): 93-109, 2008; Doi:10.3923/ajaps.2008.93.109)*

The Multi-Product Multi-Constraint Newsboy Problem with Incremental Discount and Batch Order

Ata Allah Taleizadeh, Seyed Taghi Akhavan Niaki and Seyed Vahid Hosseini

This study points out the real-world prevalence of the multiple-product multiple-constraint Newsboy problem, i.e., the Newsstand problem, in which not only there are incremental discounts on the purchasing prices, but also the orders are placed in batch forms. The constraints are the service levels and warehouse capacity. Moreover, the quantities of the orders are integer multiples of packets, each containing more than one product. The objective of this problem is to find the order quantities such that the expected sum of the shortage, holding and purchasing costs is minimized. We assume that the holding and shortage costs occur at the end of the period; they are modeled by a quadratic function and that the decision variables are integer. We present a formulation to the problem and show that it is a integer nonlinear programming model. Finally, we provide an efficient algorithm to solve the new problem and illustrate the results with a numerical example. *(Asian Journal of Applied Sciences 1 (2): 110-122, 2008; Doi:10.3923/ajaps.2008.110.122)*

Perception and Use of Climate Forecast Information Amongst Smallholder Farmers in Semi-Arid Kenya

C.W. Recha, C.A. Shisanya, G.L. Makokha and R.N. Kinuthia

This study investigates perception and use of seasonal forecast and the influence of the 2004 October-December (OND) seasonal forecast on agricultural decision-making amongst smallholder farmers in semi-arid Kenya, in agro-ecological zones UM4 and LM5. Field surveys were conducted before and after the release of OND growing season climate forecast by the Kenya Meteorological Department (KMD) in 2004. Seasonal forecast issued by the KMD indicated that the two agro-ecological zones were to receive normal tending to above normal OND rainfall of 2004. However, observed rainfall show that agro-ecological zone UM4 received near normal rainfall while LM5 received below normal rainfall. Although KMD's prediction of onset was accurate, a poor distribution in LM5 led to crop failure and losses in other farm enterprise. Despite farmers' access to seasonal forecast from KMD, majority made farm-level decisions in the light of what they perceive rather than what actually is. Majority of farmers lack confidence in seasonal climate forecast, but rate it useful, suggesting that there is a vast market for forecast information. This makes it necessary for the climate community, extension and farmers to adopt a collaborative approach to improve utilization of seasonal forecast products. Farm management strategies are not influenced by agro-ecological zones but farmers showed potential to respond to forecasts when they altered planting date and changed crop cultivars. The study demonstrates the effect of generating climate forecast on a large geographic scale and suggests a downscaled forecast product at a local level as a way of improving forecast quality. Although farmers' access forecast information and considers it useful, its integration in farm-level decision-making is still limited, a reason for concern for policy makers. *(Asian Journal of Applied Sciences 1 (2): 123-135, 2008; Doi:10.3923/ajaps.2008.123.135)*

An Efficient Generalized Minimized Residual Simulation Technique for Continuation Power Flow Studies

J. Jasni, N. Azis, H. Hizam, M.Z.A. Kadir, M.N. Mariun, S.B.M. Noor and S. Sobri

This study has been initiated to improve the time taken by the CPF method and eliminate the convergence problem for the tested system by enforcing the General

Minimal Residual (GMRES) method at the initial point at the start up, herewith referred as CPF-GMRES solver. Analyses have shown that this new algorithm not only reduced the computation time but also eliminated the convergence problem for the tested system. *(Asian Journal of Applied Sciences 1 (2): 136-146, 2008; Doi:10.3923/ajaps.2008.136.146)*

Context-Dependent DEA and Weighted-Russell Measures to Evaluate Progress and Regress

Alireza Amirteimoori

This study develops the context-dependent DEA by incorporating value judgment, inspired by Russell measure of technical efficiency to measurement technical efficiency. Next, a way of identifying progress or regress from a current period to next one is extended. This extension of DEA models, is illustrated by an empirical application to bank branches. *(Asian Journal of Applied Sciences 1 (2): 147-157, 2008; Doi:10.3923/ajaps.2008.147.157)*

Mineralogical and Fluid Inclusions Studies on the Mineralized Bostonite Dykes at UM Guruf Area, Central Eastern Desert, Egypt

B.H. Ali, M.G. El-Feky, M.A. Ali and E.K. Abu Zeid

The present study aims to elucidate the mineralogical and petrographic composition of the dykes as well as their radioactivity and factors controlling uranium mineralizations. The detailed spectrometric survey on these bostonite dykes revealed their enrichment in U and Th (700 ppm eU and 48 ppm eTh, in average, respectively). The mineralogical studies on these dykes indicate the presence uranophane and kasolite as radioactive minerals. Zircon and fluorite are the main accessory minerals and they are barren from any radioelements. The presence of the radionuclides as secondary minerals, e.g., uranophane and kasolite and their absence in the uranium-bearing minerals such as zircon and fluorite suggest that the radioactivity of bostonite is not orthomagnetic but gained post-magmatically via hydrothermal solutions. Fluid inclusion studies on quartz reveal that the temperature of the mineralizing carbonic fluids was between 282 to 303°C and give salinity values ranging from 0 to 0.9 wt% NaCl equivalent and trapped under lithostatic pressure equals 65 bar. These rich CO_2-fluids caused remobilization of uranium from the magmatic zircon and fluorite in the form of uranyl-monocarbonate. Mixing of low temperature shallow meteoric aqueous fluid

with hot carbonic fluids (~190°C) through fractures system and, consequently, the fluids pressure releasing to about 4.7 bar. The temperature gradient, changing pH and the fluid/rock interaction may have played active role during the post-magmatic stage that includes precipitation of secondary uranium as uranophane and kasolite. *(Asian Journal of Applied Sciences 1 (2): 158-167, 2008; **Doi**:10.3923/ajaps.2008.158.167)*

Effect of the Non-Standard Lightning Current and Waveshape on Lightning Surge Analysis

M.Z.A. Ab Kadir, M.H. Ahmad and J. Jasni

The withstand capability of the insulation system of an equipment under lightning overvoltages is measured by the international standard 1.2/50 µs waveform. Many workers and designers of the power apparatus equipment have dedicated their research tried to understand how the insulation behaves under the non-standard waveform. The fact that the lightning-caused transient voltage can have very fast components and the need for higher reliability and cost effectiveness have added the impetus in recent years to better understand the effects of a non-standard lightning voltage on the power system. As far as the lightning is concerned, much attention has been paid to the breakdown occurring at extremely fast rise times, which could be in nanosecond regime. This research provides some reviews on the non-standard waveform of the lightning and focuses on the simulation of the effect of the non-standard lightning current and waveshape on lightning surge analysis using the PSCAD/EMTDC software. *(Asian Journal of Applied Sciences 1 (2): 168-176, 2008; **Doi**:10.3923/ajaps.2008.168.176)*

Interlaminar Fracture Properties of Multi-Layer Woven Silk Fibre/Polyester Composites

Rozli Zulkifli, Koh Su Pei and Che Husna Azhari

The effect of the number of layers of woven silk fabric on the interlaminar fracture toughness of silk/polyester composites which is a measure of the resistance of the material to delamination crack propagation has been studied. The multi-layer woven fabric silk/polyester composites were produced by compression moulding technique with increasing layers of silk of between 8 and 14 layers in thermoset polyester. The composite panels have been tested for mode I interlaminar fracture using double cantilever beam specimens (DCB) testing method. It was found that the interlaminar fracture toughness, G_{IC} of the composite increases as the number

of silk layers increases. Stable crack propagation is observed during the tests and the crack propagation areas showed all the fibres were bare with no matrix covering them as were seen at 100x and 500x magnification using Scanning Electron Microscopy. Failure occurred at the fibre-matrix interface with no fibre bridging observed between the two fracture surfaces. The smooth clean surface of the silk fibres is the result of weak interfacial debonding and the increases in interlaminar fracture toughness is due to improve strength of the composites panel. The results give the indication of the effect of the layers because the thicknesses of all the specimens are the same. In order to increase the interlaminar fracture toughness of woven silk fibre/polyester composites, multiple layers of woven silk fibre up to 14 plies has proven to be effective. *(Asian Journal of Applied Sciences 1 (2): 177-184, 2008; Doi:10.3923/ajaps.2008.177.184)*

Analysis of Semi-Continuous Composite Beams with Partial Shear Connection Using 2-D Finite Element Approach

Messaoud Titoum, Mohamed Tehami, Belkacem Achour and Jean-Pierre Jaspart

In this study, a two-dimensional finite element model using ANSYS software was proposed to study the behaviour of semi-continuous composite beams allowing for the concept of partial shear connection in both sagging and hogging moment regions. Some comparisons with experimental data available in the literature were reported to validate the efficiency of the proposed model. Using the verified model, a parametric study was carried out to investigate the effects of partial shear connection, along with the effects of reinforcing ratio and the presence of column web stiffeners, on the behaviour of semi-continuous composite beams. Based on the results obtained from the finite element analysis, the concept of partial shear connection in the hogging moment regions can be accepted provided that the shear connectors are sufficiently ductile, in spite of the requirement of full shear connection specified in Eurocode 4 for continuous and semi-continuous composite beams. *(Asian Journal of Applied Sciences 1 (3): 185-205, 2008; Doi:10.3923/ajaps.2008.185.205)*

Modelling the Hydro-Mechanical Behaviour of Highly Expansive Clays

K. Bendani, H. Missoum, H. Khelafi and N. Laredj

This study presents a formulation for coupled moisture and air in expansive unsaturated clays. An extended critical state elasto-plastic constitutive model

based on net mean stress and suction is adopted. Numerical techniques are proposed which allow for the development of an elasto-viscoplastic solution algorithm within the context of a transient finite element analysis. The representation of the development of irreversible strains within an expansive soil has been investigated via a double structure elasto-plastic relationship. The ability of such approach to simulate the accumulation of plastic strains during wetting-drying cycles has been shown. *(Asian Journal of Applied Sciences 1 (3): 206-216, 2008; **Doi:**10.3923/ajaps.2008.206.216)*

Shear Strengthening of 3D RC Beam-Column Connection Using GFRP: FEM Study

F. Danesh, E. Esmaeeli and M. Farid Alam

In this research, effectiveness of GFRP layers for joint shear strengthening of two-way corner beam-column connection is studied through a finite element model. To this purpose, a model based on previous experimental test on one-way strengthened connection is made using general purpose finite element code ABAQUS. The FEM results are validated by comparison with the test results. This model was developed to analyze rehabilitation of two-way corner RC beam-column connection. Two models including the original and strengthened specimen (with L shape GFRP layers) were analyzed. Comparing the results of the models indicated the effectiveness of the proposed strengthening scheme in reducing story drift, increasing ultimate load carrying capacity and changing the shear failure mode to a relatively ductile mode. *(Asian Journal of Applied Sciences 1 (3): 217-227, 2008; **Doi:**10.3923/ajaps.2008.217.227)*

Effect of Chemical Solute Concentration Changes on Deformation Behavior of Expansive Clays

N. Laredj, H. Missoum, K. Bendani and M. Maliki

This study presents an investigation on the effect of the osmotic potential due to chemical solute concentration changes by the use of the net mean stress, suction and chemical concentration elastic constitutive relationship to represent the deformation behavior exhibited by expansive clays. The impact of such changes on stress/strain behavior of the soil has been accommodated by the development of a non linear elastic constitutive relationship, a state surface, which includes the effects of chemical solute concentration. In particular, it was suggested that the determination of the stiffness of the soil with respect to chemical solute

concentration could be achieved via a theoretical approach. In this study, the double layer theory is investigated and the ability of the proposed numerical model to represent it is shown. *(Asian Journal of Applied Sciences 1 (3): 228-236, 2008; **Doi:**10.3923/ajaps.2008.228.236)*

Preparation of Surfactant-Free and Core-Shell Type Nanoparticles of Methoxy Poly(ethylene Glycol)-*b*-Poly(ε-caprolactone-*co*-d,l-lactide) Diblock Copolymers

Yodthong Baimark, Yaowalak Srisuwan, Nuanchai Kotsaeng and Theeraphol Phromsopha

Methoxypoly(ethylene glycol)-*b*-poly(ε-caprolactone-*co*-D,L-lactide) diblock copolymers [MPEG-*b*-P(CL-*co*-DLL)] were synthesized by ring-opening polymerization of CL and DLL using MPEG with molecular weight of 5,000 g mol^{-1} and stannous octoate as the initiating system. Surfactant-free and core-shell nanoparticles of MPEG-*b*-P(CL-*co*-DLL) were prepared by modified-spontaneous emulsification solvent diffusion method without any surfactants. Influences of CL:DLL ratio of the diblock copolymers on nanoparticle characteristics were investigated and discussed. The sizes of colloidal nanoparticles obtained from light-scattering analysis were in the range of 84-639 nm. The nanoparticle size decreased with increasing the DLL ratio. Scanning and transmission electron micrographs indicated that the nanoparticles were spherical in shape and smooth surface. Core-shell structure of the nanoparticles consisting of the hydrophilic outer shell of MPEG and the hydrophobic inner core of P(CL-*co*-DLL) was confirmed by ^{1}H-NMR spectroscopy. *(Asian Journal of Applied Sciences 1 (3): 237-245, 2008; **Doi:**10.3923/ajaps.2008.237.245)*

Tunable Thermo Reversible Viscoelastic Gels From Self Assembly of Surfactants

P. Sudheesh, S.M. Nair and Lisa Sreejith

The phase behaviour of Cetyl Trimethyl Ammonium Bromide (CTAB) with n-octanol in presence of potassium bromide (KBr) is studied by viscosity, Differential Scanning Calorimetry (DSC), rheology and polarising microscopy. The addition of long chain aliphatic alcohols is found to promote the transformation of spherical micelles into supramolecular structures like wormy micelles and vesicle phases. A partial phase diagram based on DSC and polarizing microscopy at different temperature signals a characteristic transition temperature at which the

gel-to-vesicle phase transition takes place with changes in concentration of octanol. The rheological behaviour of the viscoelastic system was described by the Maxwell model of a viscoelastic fluid, typical of systems of worm-like micelles. *(Asian Journal of Applied Sciences 1 (3): 246-252, 2008;* ***Doi:****10.3923/ajaps.2008.246.252)*

The Machining Characteristics of Oil Palm Empty-Fruit Bunches Particleboard and its Suitability for Furniture

J. Ratnasingam, T. Mcnulty and M. Manikam

A series of machining experiments were carried out using a CNC router, with single fluted router-bits, to evaluate the machining and tool wearing properties of the particleboard made from oil palm empty-fruit bunches. The result found that the resultant machined surface of the oil palm particleboard was poor with an increased incidence of defects such as tear out and chip out on the edges of the panels compared to wood particleboard. Further, the material showed increased abrasiveness on the cutting tools due to its high silica content. Despite the shortcomings, the lower cost and environmental friendly reputation of the panels will further encourage its use in the furniture industry, especially in concealed applications. *(Asian Journal of Applied Sciences 1 (3): 253-258, 2008;* ***Doi:****10.3923/ajaps.2008.253.258)*

The Remediation Based on Old Animal Feces Effect on Radio Iodine in Uppermost Soil Layers

S.A. Hosseini and M. Bagheri

The total removed radio-iodine in surface layer of the soil demands some factors. These factors consist of detention time of animal fertilizer in the soil, amount of animal fertilizer given to soil and depth of used animal fertilizer in the soil in which were unknown and so they were determined. In the lab an experimental system reproducing the environmental conditions of the contaminated areas were designed in pots and Radio polluted sub samples soil was treated with old feces of sheep and cow which are normally used as common fertilizers. Seven days from the contamination of sub soil samples treated with animal feces as fertilizers present at the time of inoculation, a drop up to 53%, with 1/4 volume of animal fertilizer: 3/4 volume of sub sample soil in radioactivity rate was indicated, after a series of washes which simulate one year's rainfall. Radio iodine movement towards deeper soil layers, following old animal fertilizer treatments and their subsequent

stabilization reduces bioavailability in the uppermost soil horizon. *(Asian Journal of Applied Sciences 1 (3): 259-264, 2008;* ***Doi:****10.3923/ajaps.2008.259.264)*

Influence of Rayleigh Number in Turbulent and Laminar Region in Parallel-Plate Vertical Channels

Hayder A. Abdul Bari and Rana Thabet Abd Al-Rubai

The main objectives of this research is to study the influence of Rayleigh number in turbulent and laminar region in parallel-plate vertical plate so we will comparison the different between laminar and turbulence in Rayleigh number and validate it with existing experimental data available in literature. The channel was formed by two vertical parallel plates. Velocity measurements were carried out for natural convection flow in a symmetrically heated vertical channel. The plates taken were 12.5 mm thick the modified Rayleigh number (Ram) range 50 to 1×10^7 has been covered for symmetrically heated isothermal vertical surfaces. The aspect ratio of the channel was kept constant (L/b = 12) and width 200 mm. One plate was kept at fixed temperature above and the other at fixed temperature below the ambient temperature and local velocity and temperature profile at three different sections of channel were reported along with the local heat transfer coefficients and temperature distribution on the heated wall. *(Asian Journal of Applied Sciences 1 (4): 265-285, 2008;* ***Doi:****10.3923/ajaps.2008.265.285)*

Numerical Investigation on Heat Transfer Enhancement of Traverse Ribs in 3D Turbulent Duct Flow

E. Esmaeilzadeh, A. Alamgholilou and H. Mirzaie

In this study, investigation on hydrodynamic and forced convection heat transfer in a rectangular horizontal duct have been studied. Heat sources were cross rectangular ribs with small aspect ratio and uniform heat flux under turbulent regime. The purpose of this study is application of a passive method to increase rate of heat transfer from the ribs. Geometry and the physics of the problem are similar to cooling of electronic boards. Therefore three rectangular ribs established along the width of the channel with specified distance from each other. Between ribs some vortexes were appeared which in general were acted as heat traps and thus reduced heat transfer rate. These thermal resistances should be neutralized by applying heat transfer enhancement methods. Due to low pressure of these areas in comparison with their surrounding environment, establishing holes between the ribs is an appropriate method for vanishing the heat traps. Actually by applying

holes between the ribs, some distortions in the vortex patterns are made and an enhancement in the heat transfer due to existence of secondary flows, are made subsequently. These phenomena are occurred without any outsource energies. This method classified as passive method. Numerical simulation for assumed geometry is performed by solving governing equations in finite volume with Phoenics software. The obtained simulated results indicate good agreements with experimental investigations which have been reported by other researchers. Comparison between plain and passive cases shows that performance evaluation criteria (PEC) is highly dependant on the holes geometric parameters, specially their numbers and arrangements. Nine different arrangements for holes with same number of holes were studied comprehendly in this research. *(Asian Journal of Applied Sciences 1 (4): 286-303, 2008;* ***Doi:****10.3923/ajaps.2008.286.303)*

An Enhanced Numerical Approach in Entrance Region of Annular Passages

S.F. Ranjbar

In this study, a numerical method is presented to solve the laminar flow forced convection in combined entry length of annular duct. The fluid viscosity has been taken as a function of temperature. The governing equations which have the elliptic nature are solved in coupled form by successive over-relaxation finite difference method. A feature of this scheme is the easy implementation of solid boundary conditions. A FORTRAN code is written for all the simulation processes. The fluid having Prantdl numbers ranging from 0.01 to 10 are considered. Comprehensive comparisons were made between the results of present method and available data, in which good agreement would exist. *(Asian Journal of Applied Sciences 1 (4): 304-315, 2008;* ***Doi:****10.3923/ajaps.2008.304.3015)*

Seismic Retrofit of Steel Frames Using Steel Plate Shear Walls

M. Mahtab and M. Zahedi

In this study, by retrofitting a ten story bending frame an economical comparison between two lateral load resisting system, steel plate shear wall and cross bracing system has been done. For this purpose by using a series of trial and error processes the considered structure retrofitted by two mentioned systems and evaluated by pushover analysis in accordance with FEMA 356. Finally, by comparison of these two retrofitting methods, it is observed that retrofitting by a steel plate shear wall, the use of the existing frame will be optimized and also, by

using the steel plate shear wall, the consumed steel volume in retrofitting is about 30% lower than bracing and if using the minimum 3 mm thickness due to practical consideration, it will be about 15% lower than bracing. *(Asian Journal of Applied Sciences 1 (4): 316-326, 2008; **Doi:**10.3923/ajaps.2008.316.326)*

Trace Element Studies and Origin of Magnetite Quartzite Iron Formations of Northern District of Tamil Nadu, India

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The present study is an attempt to understand the mineralogical and geochemical characteristics of iron formations especially, the ferried group of elements and their significance in the origin to selected iron formations of northern districts of Tamil Nadu. Fourier Transform Infrared (FTIR) spectroscopy and ore microscopic investigation reveals that, the banded magnetite quartzite samples consist of magnetite and quartz as major minerals with hematite, grunerite, hornblende, hypersthene, goethite and chlorite as accessory minerals. About 36 magnetite quartzite samples were analyzed for the ferride group of elements of study regions. The results of chemical analyses of ferride group elements like Mn, Ni, Ti, Co, Cr and V in the iron formations of different regions are presented and interpreted. Lower concentration of these elements in the iron formations indicate that source of materials derived from weathering of landmasses. Further enrichment of Ti and Cr compared to other elements suggest the BIF's are of metasedimentary in origin. *(Asian Journal of Applied Sciences 1 (4): 327-333, 2008; **Doi:**10.3923/ajaps.2008.327.333)*

Evaluating the Machining Characteristics of Oil Palm Lumber

J. Ratnasingam, T.P. Ma, M. Manikam and S.R. Farrokhpayam

A series of machining experiments were carried out using a CNC multi-function machine, to evaluate the sawing, routing and boring as well as the tool wearing properties of the oil palm lumber. The result found that the resultant machined surface of the oil palm lumber of higher densities (>500 kg m^{-3}) is comparable to that of solid Rubberwood. Further, it was also found that the machining properties of oil palm lumber was markedly improved when machining at high cutting speeds, which in turn significantly reduced the incidence of machining defects such as fiber tear out and chip out. However, with higher cutting speeds, accelerated tool wear is inevitable and coupled with the fact that the oil palm lumber is markedly

abrasive due to its high silica content, the resulting tooling cost is a concern. Hence, the development of new tooling for the machining oil palm lumber is recommended. Despite this shortcoming, the lower cost and environmental friendly reputation of the oil palm lumber should encourage wider utilization of the material in the furniture industry. *(Asian Journal of Applied Sciences 1 (4): 334-340, 2008; Doi:10.3923/ajaps.2008.334.340)*

Factors Affecting on Thyroid Cancer Incidence in Residentials of South-Eastern in Iran

S.A. Hosseini

It has been hypothesized that changes in thyroid cancer incidence is due to the genetic, environmental factors and radiation. This study investigated an important aetiological cause occurrence of thyroid cancer in residentials of south-eastern in Iran. Affected factors on thyroid cancer incidence has been researched by questionnaire in 100 families of two villages of Sistan and Balouchestan of Iran in 2007. These consist of radioactivity of drinking water, radioactivity of consumed nutrient and genetical factors. The questions of questionnaire are about consumed animal or plant food, happened thyroid cancer in near or far family and occurred thyroid cancer in individual. The questions in the questionnaire have been completed by replying the families. The results showed that radioactivity of drinking water, radioactivity of consumed food does not affect thyroid cancer occurrence, but genetical situation of families would take a part on thyroid cancer in these regions. The statistic method of Fisher Exact Test has been applied to confirm the results. *(Asian Journal of Applied Sciences 1 (4): 341-346, 2008; Doi:10.3923/ajaps.2008.341.346)*

Fatigue Analysis of the Weldments of the Suspension-System-Support for an Off-Road Vehicle under the Dynamic Loads Due to the Road Profiles

F. Vakili-Tahami, M. Zehsaz and M.R. Alidadi

In this study, a numerical method has been developed to estimate the fatigue life of the vehicle chassis-components. The application of this method will significantly reduce the expenses for the required practical or in-service tests. In this method, firstly, using MATLAB, the real but random profiles for the standard roads have been produced on the basis of the random vibration theories, which give the spatial profile data in terms of time. These profiles have been used to study the dynamic

behavior and to design the vehicle chassis. Then, a complete off-road-vehicle model has been developed and first-stage results have been used as input data to simulate the dynamic behavior of the model and to calculate the forces and displacements of the chassis structure using MSC.ADAMS. In this way, the optimum stiffness of the suspension system has been obtained. Finally, using the FEM based software; ANSYS, the stress distribution in a selected part-weldment (support of the front suspension system) has been obtained and fatigue life of the structure-components welds; joining the suspension system to the off-road vehicle chassis, has been calculated and the effects of the dynamic loads due to the road profiles have been studied. *(Asian Journal of Applied Sciences 2 (1): 1-21, 2009; **Doi**: 10.3923/ajaps.2009.1.21)*

The Effect of Connection-Plate Thickness on Stress of Truck Chassis with Riveted and Welded Joints under Dynamic Loads

M. Zehsaz, F. Vakili Tahami and F. Esmaeili

In this study the mechanical behaviour of a semi-heavy truck chassis has been studied using finite element based Ansys Code and the stress distributions in the chassis have been obtained and examined. For this purpose, the FE model of the truck vehicle has been created using 3D shell elements. To validate the FE model of the chassis; firstly, experimental modal analysis has been used. Secondly, the modes of chassis-vibration, natural frequencies and modal shapes have been obtained from the FE analysis and were compared with the results of experimental modal analysis. The dynamic forces due to the unevenness of the road have been calculated using a simple 3D dynamic model of the truck body. Then, stress analysis for the truck chassis have been carried out under static and dynamic loads. Different types of joints and their thickness in the chassis of truck vehicles are one of the important parameters which have significant effect on their strength. To study the effect of the connecting plates on the strength of the chassis, the strength of the welded and also the combined welded-riveted joints has been analyzed with three different plate thicknesses: 5, 8, 12 mm. The results show that the amount of stresses in chassis and connection plates are decreased significantly with increasing the thickness of connection plates. Also, it has been shown that the use of combined welded-riveted joints reduces the stress level of the chassis. The results prove the precision of the FE modeling and they show that the numerical modeling is accurate and therefore, the stresses which have been obtained are reliable and can be used to design the chassis. *(Asian Journal of Applied Sciences 2 (1): 22-35, 2009; **Doi**: 10.3923/ajaps.2009.22.35)*

Comparing Classical and Modern Signal Processing Techniques in Evaluating Modal Frequencies of Masjed Soleiman Embankment Dam during Earthquakes

M. Davoodi, M.A. Sakhi and M.K. Jafari

In this study, the classical and modern signal processing methods are used to extract dominant frequencies of Masjed Soleiman dam, the highest embankment dam in Iran. The signals were recorded in the gallery, mid-height and the crest of the dam during local earthquakes. Since the amplitude and frequency contents of earthquake acceleration time histories vary with time, classical signal processing techniques are limited to extracting the exact characteristics of the signal. Time-frequency distribution and wavelet analysis were used in this study to overcome this limitation. The proposed modal frequencies of the dam body were evaluated using both the classical and new techniques and the results compared. Differences between the two sets of methods are described and the benefits of the modern signal processing methods are discussed. It is shown that, in non-stationary signals such as earthquake records, higher frequencies are extracted by modern methods that cannot be obtained using classical methods. Besides, the spectral variations of the scalograms clearly indicate that lower frequency contents become more dominant as the excitation amplitude decreases. The lower mode shapes of dam body are excited during the weak part of an earthquake, whereas during the stronger part, all the high and low modes are excited. *(Asian Journal of Applied Sciences 2 (1): 36-49, 2009;* ***Doi:*** *10.3923/ajaps.2009.36.49)*

Comparing Numerical Analysis Predictions and Experimental Data for Shirindarreh Embankment Earth Dam

E. Aflaki

This study deals with the analysis and monitoring aspects of Shirindarreh earth dam with the height of 64 m which is located in the northern Khorasan Province in Iran. Characteristics of the foundation and six types of available materials for construction are described. For design of this dam, the major considerations were controlled under seepage and deformations i.e., arching and settlement criterion. Large deformation of the body and foundation of an earth dam can cause the core to be cracked. As a result, concentrated seepage and piping through the core might be developed. On the other hand, control of the stresses in the core and shell needs specific attention to the arching phenomena. To achieve the above mentioned purposes data from monitoring of instrumentations have been compiled.

Stress-strain distribution in the body and foundation of the Shirindarreh earth dam at the end of construction is evaluated using PLAXIS software (Version 7.2) and its hardening soil model which is based on total stress approach. The results have been compared with measured data. Generally, the results of back analyses show good agreement with those of instrumentation. *(Asian Journal of Applied Sciences 2 (1): 50-62, 2009;* **Doi:** *10.3923/ajaps.2009.50.62)*

Superconducting Properties of $(Tl_{1.6}Pb_{0.4})$-2223 Substituted by Praseodymium

R. Awad, S.G. Elsharkawy, I.H. Ibrahim and B.H. Chazbeck

The lattice parameters, electrical resistivity, ac magnetic susceptibility, magnetoresistance and Hall effect have been measured for a newly developed compound obtained through partial substitution of Ca^{2+} ions by Pr^{3+} ones in $(Tl_{1.6}Pb_{0.4})$ $Ba_2Ca_2Cu_3O_{10-\delta}$. For such compound, the prepared samples are almost single phase of (Tl, Pb)-2223 tetragonal unit cell with a space group 14/mmm. An opposite behavior for both lattice parameters a and c was observed as the concentration of Pr-content was increased. Also, metallic tendency was observed from electrical resistivity measurements in the range of $0 \le x \le 0.15$ for temperature values above the superconducting transition temperature T_c. On the other hand, a semiconductor-like behavior was noticed for values x>0.15. Suppression in the superconducting transition temperature was found as the Pr-content was increased. This suppression in superconductivity for the system evolved was discussed according to two models point of views; the Cooper-pair breaking and hole-filling models. The transverse magnetoresistance, below the superconducting transition temperature, was measured in a weak magnetic field up to 4.8 kg. Finally, the Hall voltage was measured at different temperature values above that of superconducting transition using five-probe technique. The Hall coefficient, Hall mobility and Hall angle were expressed as functions of both temperature and Pr-content. *(Asian Journal of Applied Sciences 2 (1): 63-73, 2009;* **Doi:** *10.3923/ajaps.2009.63.73)*

Deposition of Oxide Layer on Aluminium Via Plasma Electrolysis Method in Alkali Solutions by Unipolar Pulsed Current System and Study of its Physical Properties

N. Parvini Ahmadi, R.A. Khosroshahi and B. Baghal Asl

The principle aim of the present study is to produce Plasma Electrolytic Oxidation (PEO) coating on aluminum via unipolar pulsed current system and to indicate that

it is possible to attain the similar bipolar system results reported in the literature. A brief comparison was also made between unipolar deposit properties with those achieved via direct current (duty cycle 100%) system. In the present study, a hard ceramic layer was produced on aluminum by PEO method under unipolar pulsed current system. The results showed that unipolar pulsed current system considerably improves oxide layer properties due to its better deposit growth control as compared with direct current system. The mean hardness value of the PEO coating was found to be 1700 Vickers. *(Asian Journal of Applied Sciences 2 (1): 74-82, 2009;* ***Doi:*** *10.3923/ajaps.2009.74.82)*

Electroless Ni-P Deposition on WE43 Magnesium Alloy Substrate

R. Azari Khosroshahi and N. Parvini Ahmadi

With the aim of study the nucleation and growth mechanism electroless Ni-P plating was applied to electrochemically heterogeneous WE43 magnesium alloy substrate. Experimental results revealed that the coating was preferentially nucleated on equilibrium β phase at along some grain boundaries and matrix dislocations. These were then spread to primary α phase. X-ray diffraction analysis of as deposited coatings showed a broad peak in the spectra, indicating an amorphous structure possibly with small microcrystalline areas. These were transformed to crystalline phase after annealing at temperatures 250 and 400°C for 1 h. Micro hardness testing results showed an increase in hardness from mean values of 650 Vickers for as plated samples to 960 and 1030 Vickers for the coated samples after annealing at 250 and 400°C for 1 h, respectively. *(Asian Journal of Applied Sciences 2 (1): 83-90, 2009;* ***Doi:*** *10.3923/ajaps.2009.83.90)*

Simulation of Paris-Erdogan Crack Propagation Model with Power Value, M = 3: The Impact of Applying Discrete Values of Stress Range on the Behaviour of Damage and Lifetime of Structure

A.A. Shariff

The aim of this study is to investigate the impact of applying stress sequence in the form of discrete values of ascending and descending order of the same range on the behaviour of damage. The behaviour of the crack propagation as well as the lifetime of structure is investigated when M, which is the power value in the crack propagation Paris-Erdogan model is taken to be equal to three (M = 3). It is found

that bigger stress or loadings imposed on the structure at the beginning of its life will result in a bigger damage. As a result, the lifetime of the structures is shorter as compared to the one which starts with lower stress. *(Asian Journal of Applied Sciences 2 (1): 91-95, 2009;* **Doi:** *10.3923/ajaps.2009.91.95)*

Molecular Interaction Studies on Some Organic Liquid Mixtures at Different Temperatures Using Ultrasonic Technique

P. Vasantharani, P. Kalaimagal and A.N. Kannappan

The ultrasonic velocity, density and viscosity in ternary liquid mixtures of tri-n-butyl amine (TBA), n-hexane with aliphatic alcohols viz., 1-pentanol and 1-hexanol have been measured at three different temperatures 303, 308 and 313 K for the entire range of concentration using an ultrasonic interferometer. The measured data are used to compute the acoustical properties, namely adiabatic compressibility (β), free length (L_f), free volume (V_f) and internal pressure (π_i) and their excess values. The intermolecular attraction between the components dependence on the mutual association of similar molecules and there disassociation due to attraction between dissimilar molecules. The strength of the bond dependence on the length of the alkyl chain and the branching in the alkyl group. *(Asian Journal of Applied Sciences 2 (1): 96-100, 2009;* **Doi:** *10.3923/ajaps.2009.96.100)*

Preliminary Investigation of a Converted Four-Stroke Diesel to Alpha V-Shaped Stirling Engine

I.M. Yusof, N.A. Farid, Z.A. Zainal, G.B. Horizon and M. Azman

This study presents a preliminary investigation on a converted four-stroke diesel to an air charged V-shaped Alpha Stirling engine. The engine was manufactured with a total swept volume of 194 cc., volume compression ratio of 1.84, 90° phase angle and air as a working gas. The engine was designed to fulfill the requirements of hot end temperature up to 1000°C, cold end temperature of 20 to 30°C, charge pressure of minimum 1 bar or above and engine speed up to 1200 rpm. Design considerations of developing a simple and low cost Alpha-typed Stirling engine using major components of both commercial diesel engine and industrial mass production were discussed. Major modifications were done on the engine heater head design in order to cater for both natural gases and biomass fueled heating process as the external heat source. The net power output was estimated about 25 W at minimum charge pressure of 1 bar using Beale formula. The preliminary results show that the friction torque increases with the increase of engine speed. The minimum friction torque of 0.80 Nm was obtained

at minimum speed of 300 rpm and the maximum friction torque obtained was approximately 1.30 Nm at the speed of 1200 rpm. The gas pressure inside the working cylinder also increases with the increase of engine speed and the maximum mean pressure obtained with the effect of engine speed and hot temperature was approximately 1.41 bar. *(Asian Journal of Applied Sciences 2 (2): 101-114, 2009;* ***Doi:*** *10.3923/ajaps.2009.101.114)*

Investigating Synergism in Critical Micelle Concentration of Anionic-Nonionic Surfactant Mixtures: Surface Versus Interfacial Tension Techniques

Mazen Ahmed Muherei and Radzuan Junin

In this research, anionic (SDS) and nonionic (TX100) surfactant mixtures (1:2, 1:1, 2:1; TX100: SDS mass ratios) were evaluated for possible synergism in Critical Micelle Concentration (CMC). Synergism of both surfactants was sought in presence of shale and/or oil phase. The composition of mixed micelles and the interaction parameter, â evaluated from the CMC data obtained by both Surface Tension (ST) and Interfacial Tension (IFT) for different systems using Rubingh's theory were discussed. Both techniques give comparable conclusions regarding synergism in CMC. However, using IFTs to determine CMCs before and after equilibration with shale showed greater losses of nonionic surfactant than using ST technique. For the interfacial tension data, β-values ranges from -5.803 to -5.917 before equilibration with shale and from -1.286 to -2.045 after equilibration with shale for the mixtures with TX100 mole fractions of 0.18 and 0.47, respectively. This result suggested that synergism was always stronger before equilibration with shale and/or contact with oil phase. Among the mixtures studied, the mixture with higher TX100 mole ratio exhibit more synergism than others. This is particularly true after equilibration with shale and/or contact with oil phase pointing out to the role, the losses of TX100 may have on synergism of TX100-SDS mixtures. *(Asian Journal of Applied Sciences 2 (2): 115-127, 2009;* ***Doi:*** *10.3923/ajaps.2009.115.127)*

Material and Magnetization Effect on Permanent Magnet Motor Design

M.A. Tavakkoli and S.M. Madani

Permanent Magnet (PM) motor materials affect on their developed torque, torque pulsation and other performances. However, the performance sensitivity to the material changes by material and motor types (SFPM, Inset, IPM, Buried ...).

Usually, PM motor designers optimize the motor based on motor dimensions and topology and less on material selection. However, material has significant effect on motor performances. Choosing high quality and expensive material does not always guarantee to improve torque quality and quantity. This study analyzes the performance sensitivity versus material magnetic characteristics for SFPM and IPM motors. Moreover, the optimum material based on developed average torque is presented. Then, we analyze PM magnetization effect on air gap magnetic flux density. *(Asian Journal of Applied Sciences 2 (2): 128-138, 2009; **Doi:** 10.3923/ajaps.2009.128.138)*

Comparative Study of Different Hierarchical Bases of Finite Element Method: Application to Elastostatic Analysis of Two-Dimensional Structures

M.K. Sangare, E. Danho, R.N. Djue and K.E. Kanga

This study briefly presents three types of well known and widely used hierarchical *p*-element shape functions: the noninterference condition formulation, the Lagrange formulation and the Legendre formulation for both quadrilateral and triangular elements. A comparative study of these three formulations is made through a set of linear elastic two-dimensional numerical applications. The meshes used are essentially made of 9 node quadrilateral and 7 node triangular elements for initial comparisons. The results of these comparisons indicate that even if the Legendre type formulation exhibits the better condition number of stiffness matrix, it is not the best *p*-element formulation in case of distorted meshes or for convergence stability of computed values of stress. *(Asian Journal of Applied Sciences 2 (2): 139-149, 2009; **Doi:** 10.3923/ajaps.2009.139.149)*

Cluster Analysis of Rainfall-Runoff Training Patterns to Flow Modeling Using Hybrid RBF Networks

H. Abghari, M. Mahdavi, A. Fakherifard and A. Salajegheh

The artificial intelligence modeling of nonstationary rainfall-runoff has some restriction in accuracy of simulation base on complexity and nonlinearity of training patterns. Statistical preprocessing of trainings could determine homogeneity of rainfall-runoff patterns before modeling in artificial intelligence. In this study, the new hybrid model of artificial intelligence in conjunction with statistical clustering is introduced. Statistical pre-processing effects of 360 rainfall-runoff patterns considered before modeling using Radial Basis Function Neural Networks

(RBFNNs). In the first step all 360 monthly rainfall-runoff patterns classify by cluster analysis in 4 groups and each class modeled by different RBFNNs topology. Results of 4 cluster base-RBFNNs compare with no action one and the optimized structure of Hybrid Cluster base-RBFNN models of Nazloochaei river flow present. Results show that clustering of rainfall-runoff patterns and modeling of each dataset by different RBFNNs has higher accuracy than no preprocessing of patterns in prediction and modeling of river flow. *(Asian Journal of Applied Sciences 2 (2): 150-159, 2009; **Doi**: 10.3923/ajaps.2009.150.159)*

Social Representation of Students from Two Engineering Schools According to Their Future Professional Activities

L.K. Houssou

This study examines the social representation of students from two engineering schools at the Institut National Polytechnique Félix Houphouët Boigny (INP-HB) according to their future occupations. It contributes to the general literature of social representation by focusing on the quantitative method of paired comparison. The investigation was carried out by establishing a scale of preference for nine statements expressing various professional activities performed by engineers. A group of students from two engineering schools (College of Industry (ESI) and College of Commerce and Business Management (ESCAE)) participated in this research. Results have shown that the application of the method of paired comparisons in the hypothesis of three by Thustone makes the discriminative variance process remains constant whatever the pairs considered. The calculation of scores is made from the conversion of frequency into standard deviation. This conversion has allowed us to obtain the matrix of standard deviation for each school. The average of standard deviation for each item column is calculated to obtain the average score for the items considered. According to the items selected, students have divergent choices depending on their membership to a particular school. Thus, knowledge produced by the analysis of representation is not only a mere analysis of speech or interpersonal exchanges, but it constitutes an invaluable means for the understanding of the basic system of thought and personal or collective actions of the students. *(Asian Journal of Applied Sciences 2 (2): 160-168, 2009; **Doi**: 10.3923/ajaps.2009.160.168)*

Ultrasonic Velocity, Viscosity, Density and Excess Properties of Ternary Mixture of N-Methylcyclohexylamine+Benzene+1-Propanol

P. Vasantharani, V. Pandiyan and A.N. Kannappan

Ultrasonic velocity (U), viscosity (η), density (ρ) has been measured for ternary mixture of N-methylcyclohexylamine with 1-propanol using benzene as a solvent at three temperatures 303.15, 308.15 and 313.15 K, over the entire range of composition. Adiabatic compressibility (β), free length (L_f), free volume (V_f) and internal pressure (π_i) have been calculated using experimental values of ultrasonic velocity (U), viscosity (η) and density (ρ). The results have been used to discuss the nature and strength of intermolecular interactions in the system. Excess values of the above said parameters were plotted against the mole fraction of N-methylcyclohexylamine over the entire composition range, indicates that the strong and weak hydrogen bonding interaction between the molecules of the mixture. *(Asian Journal of Applied Sciences 2 (2): 169-176, 2009;* **Doi:** *10.3923/ajaps.2009.169.176)*

Nematic Calamitic Bisazobenzene Liquid Crystal: Synthesis and Mesomorphic Properties of 1-Methoxybutyloxy-4`-(4-Phenylazo) Azobenzene

M.Z.A. Rahman, A.A. Salisu, S. Silong, M.R. Lutfor and M.B.A. Ayub

A new calamitic liquid crystal material with rod-shape bisazobenzene moieties as a core has been synthesized and characterized by spectroscopic methods. The mesomorphic properties were investigated by differential scanning calorimetry and polarizing optical microscopy. The rod-shaped molecule 1- methoxybutyloxy-4`-(4-phenylazo)azobenzene was prepared by diazotization of 4-phenylazoaniline, coupling with phenol and subsequent etherification of 1-Bromobutyloxy-4`-(4-phenylazo) azobenzene in methanol. The presence of nematic mesophase was confirmed by the textures. *(Asian Journal of Applied Sciences 2 (2): 177-183, 2009;* **Doi:** *10.3923/ajaps.2009.177.183)*

Flow Injection Analysis System for the Determination of Total Phenolic Compounds by Using Folin-Ciocalteu Assay

K. Leamsomrong, M. Suttajit and P. Chantiratikul

A simple, rapid and reliable flow injection analysis system for the determination of total phenolic compounds using the Folin-Ciocalteu method was established. The

detection method was based on the reduction of a mixture of phosphotungstic and phosphomolybdic acid (Folin-Ciocaltue reagent) to tungsten and molybdenum oxide by phenolic compounds in the basic media and subsequent formation of a blue color product. The standard or sample solutions were injected into a carrier stream (distilled water) to react with a folin ciocaltue reagent and sodium carbonate to give the blue color product which was detected by spectrophotometer at 765 nm. The experimental conditions such as sample volume, flow rate of carrier and reagents, length of reaction coils and concentration of reagents were optimized. The relative standard derivation, RSD (20 replicates) of 5 ppm gallic acid was 0.72% with the detection limit (3S/N) of 0.0231 mg L^{-1}. A good linear calibration curve in the range of 0.5-100.0 mg L^{-1} was obtained with regression equation y = 0.0123x + 0.021, R^2 = 0.9991. The sampling throughput was 32 samples per hour. The effect of potential interferences such as citric acid, fructose and others were examined. The proposed method was successfully applied for the determination of the total phenolic compounds in tea. *(Asian Journal of Applied Sciences 2 (2): 184-190, 2009;* ***Doi:*** *10.3923/ajaps.2009.184.190)*

Study of Structure, Surface Morphology and Optical Property on ZnO: Al Thin Films as Anti-Reflecting Coating

H. Abdullah, R. Silvia and J. Syarif

The significant influences of substituting low concentration Al at Zn-site as an anti-reflecting coating (ARC) for $Zn_{1-x}Al_xO$ compound on structure; morphology and optical property have been studied. The $Zn_{1-x}Al_xO$ sample with x = 0, 5, 10 and 15 wt.% were synthesized via a sol gel method. The films obtained from the sol gel method have been annealed at 400°C for 2 h. The XRD, SEM and AFM have been applied for characterizing the structure and the morphology of the film. XRD spectra show all samples exhibit hexagonal structure. The morphological measurements show that particle size decreases with increasing the concentration of Al. These films exhibit a denser and compact film's structure that could be effective in light trapping in thin film solar cells. The optical property has been characterized using UV-Visible-NIR spectrometer. The values of band gaps increase as the concentration of Al increases. The increase of the band gap is acceptable as a requirement for good anti-reflecting coating element. Therefore these films can be applied as anti reflecting coating thin film solar cells. *(Asian Journal of Applied Sciences 2 (2): 191-196, 2009;* ***Doi:*** *10.3923/ajaps.2009.191.196)*

Comparison of Static and Dynamic Backcalculation of Flexible Pavement Layers Moduli, Using Four Software Programs

M. Ameri, N. Yavari and T. Scullion

Backcalculating layer moduli, using the deflections measured by the FWD (Falling Weight Deflectometer) device, is the basis for structurally evaluating pavements when considering maintenance and rehabilitation options. Many algorithms have been developed to perform the backcalculation. Most of them are based on simplified assumptions such as the elastic behavior of the pavement and static load. These algorithms use the peak values of loads and deflections recorded by the FWD sensors. The dynamic analysis, to the contrary, accounts for the dynamic nature of the load and factors such as material inertia and damping. These algorithms use as inputs both load and deflection time histories measured by the FWD. In this research, three software programs, MODULUS 6.0, ELMOD 5.0 and EVERCALC 5.0, were used to do the elasto-static back-analysis and the DBSID program was employed for the dynamic backcalculation. The FWD data gathered from different test sites, including the Zanjan-Tabriz, Eivanekey-Garmsar and Garmsar-Semnan freeways and also Rafsanjan airport have been used in this evaluation. The results have been compared, the performance of each program has been evaluated and the best software for the sites under study is suggested. *(Asian Journal of Applied Sciences 2 (3): 197-210, 2009;* **Doi:** *10.3923/ajaps.2009.197.210)*

Seismic Design of FRP Reinforced Concrete Structures

M. Kazem Sharbatdar and Murat Saatcioglu

Experimental research has been conducted at the Structures Laboratory of the University of Ottawa to investigate the seismic performance of FRP reinforced concrete structural elements. Large scale columns and beams are being tested under simulated seismic loading. Fiber Reinforced Polymer (FRP) reinforcement is being developed in the form of longitudinal bars and transverse grids for use in new concrete elements in bridges and buildings. Since, this kind of reinforcement shows linear stress-strain characteristics up to failure and has low ductility, serious concerns should be considered about their applicability to earthquake resistant structures. The results of selected tests are summarized in this study, with the assessment of their significance from seismic performance perspective. Column and beam specimens were tested under lateral deformation reversals. The members were reinforced with carbon FRP bars in the longitudinal direction and

carbon FRP grids in the transverse direction. Both the columns and the beams sustained a minimum of 2-3% lateral drift ratios, meeting seismic drift limitations of most building codes. Test results indicate that FRP reinforced concrete elements exhibit reduced stiffness and softened response because of the lower elastic modulus of FRP bars. This may suggest reduced spectral values associated with longer vibration periods, as well as increased deformability, resulting in seismic resistant structures for which elastic design approach with sufficient deformability may be appropriate. *(Asian Journal of Applied Sciences 2 (3): 211-222, 2009;* **Doi:** *10.3923/ajaps.2009.211.222)*

Engineered Cementitious Composites for Repair of Initially Cracked Concrete Beams

A.M. Anwar, K. Hattori, H. Ogata, M. Ashraf and Mandula

The current research addresses Engineered Cementitious Composites (ECC) as a new alternative for retrofitting damaged concrete beams. Twenty-one plain concrete beams with pre-defined artificial cracks were prepared and repaired using different combinations of ECC alone or together with Carbon Fiber Reinforced Polymers (CFRP). The study showed that replacement of the inferior layer from the bottom of the deteriorated beams with a thin layer of ECC could be able to restore the beam to a condition better than its original state. Moreover, the repair with ECC was found effective in enhancing the member ductility as well. It was also shown that pasting CFRP directly over ECC substrate resulted in shear failure rather than the undesirable interfacial debonding mode of failure that typically occurs in case of concrete substrates. *(Asian Journal of Applied Sciences 2 (3): 223-231, 2009;* **Doi:** *10.3923/ajaps.2009.223.231)*

Three-Dimensional Numerical Modelling Study of Sound Speed in the Persian Gulf

M. Sadrinasab and K. Kenarkohi

The three-dimensional variability of sound speed in the Persian Gulf is investigated. In this study, a three-dimensional hydrodynamic model (COHERENS) is employed in a fully prognostic mode to derive sound speed profiles in the Persian Gulf, an evaporation-driven inverse estuary that is governed by the import of surface water from the adjacent ocean and the export of saline bottom gulf water through the Strait of Hormuz. During spring and summer, a cyclonic overturning circulation establishes along the full length of the Gulf. During autumn and winter, this circulation breaks up into mesoscale eddies, laterally stirring most of the Gulf's

surface waters. Results of the model show that sound speed in the Persian Gulf depends mainly on the temperature in the surface layer whereas the bottom layer as well as the southern part of the Gulf depends on temperature and salinity. Maximum sound speed occurs during the summer in the Persian Gulf which decreases gradually moving from the Strait of Hormuz to the north western part of the Gulf. A gradual decrease in sound speed profiles with depth was commonly observed in almost all parts of the Gulf. However, an exception occurred in the Strait of Hormuz during the winter. The results of the model are in very good agreement with earlier observations. *(Asian Journal of Applied Sciences 2 (3): 232-239, 2009;* **Doi:** *10.3923/ajaps.2009.232.239)*

Analytical Solution for Free Vibrations of a Mass Grounded by Linear and Nonlinear Springs in Series Using He's Parameter-Expanding Methods

A. Kimiaeifar, A.R. Sohouli, M. Rahimpour, M. Vaezi and [2]D. Ganji

In this study, a powerful analytical method, called He's Parameter-Expanding Method (PEM) is used to obtain the exact solutions of nonlinear free vibrations of a mass grounded by linear and nonlinear springs. Based on a single equation of motion in terms of relative displacement variable, a qualitative analysis is completed and some interesting dynamic behaviors are discovered. The ranges of oscillations are determined and expressions of exact periods for symmetric and asymmetric oscillations are established. It is shown that one term in series expansions is sufficient to obtain a highly accurate solution, which is valid for the whole solution domain. Moreover, the numerical solution based on shooting method and fourth order Runge Kutta method have been developed. Comparison of the obtained solution with those obtained using numerical method shows that this method is effective and convenient for solving this problem. This method introduces a capable tool for solving this kind of nonlinear problems. *(Asian Journal of Applied Sciences 2 (3): 240-247, 2009;* **Doi:** *10.3923/ajaps.2009.240.247)*

The Effect of Heat on Radio Iodine in Water in Sistan and Blouchestan Province of Iran

S.A. Hosseini, A.A. Rakhsh Khorshid and M.E. Qureshi

The study was conducted for the investigation of heat effect on radioactivity in the drinking water of chah-nimeh Station of Zaboul and Khatam hospital well for irrigating gardens of Zahedan in Iran. This drinking water supply has provided

drinking water of Zahedan. The technique of Gamma Ray Counting was applied using I-125 detector. Activity concentration levels due to I^{125} was measured in 50 mL water samples collected at a volume of about 500 mL at the depth level of 0-25 cm with a step of 5 cm depth. It is resulted that activity concentration range of the concerned radio nuclides in case samples of Zaboul for 20, 30 and 40°C temperature of the drinking water were as follows: 6.08±0.08, 15±0.17 and 6.6±0.8 Bq L^{-1}, respectively and control samples 5.6±0.08 Bq L^{-1} for any temperature. Radioactivity concentration from Khatam hospital well water case samples were 12±2, 14±2 and 13±5 Bq L^{-1}, for 5, 10 and 15°C temperature, respectively. The slightly higher value of radio iodine in the drinking water of Zaboul city in case samples relative to control samples may be due to the use of temperature for case samples. Heating case samples causes raised radioactivity in Zahedan which support the result of drinking water. Knowledge of temperature variation effect on radio-iodine in water was particularly essential for estimating iodide group, especially I-129 transfer to fluvial systems and for successfully measuring radio-iodine in water studies Before the radiometric measurements, chemical analysis for concentration of Na, Ca and Mg was also carried out along with the measurement of electrical conductivity and pH of the water samples. *(Asian Journal of Applied Sciences 2 (3): 248-252, 2009;* **Doi:** *10.3923/ajaps.2009.248.252)*

A Novel and Proven System for Non-Invasive Blood Glucose Monitoring using HbA1C

J. Sundararajan, V. Palanisamy and Mandyam Sandeep

In this study, we present a novel framework for blood glucose level measurement using a combination of the HbA1c test and the stable, accurate Photo Acoustic methods to get an absolutely consistent and precise, non-invasive technique. The setup uses a pulsed laser diode as a source rather than the typical Nd: YAG laser, since it gives a possibility for variable input wavelength pulses. The detector has a double ring sensor as the main module. It is based on the piezoelectric detection. The two ring sensor is used since it has a small opening angle. The detector setup used in this application consists of a ring detector that includes two double ring sensors that are attached to the ring shaped module that can be worn around the finger. The major aim is to detect the photo acoustic signals from the glycated hemoglobin with the least possible error. The proposed monitoring system is designed with extreme consideration to the precision and the compatibility with the other computing devices. The results obtained in this research have been studied and analyzed by comparing these with the results with the *in vitro* techniques like

the HPLC. The comparison between the two results has been plotted and it shows a least error. The results also show a positive drive for using this concept as a basis for future extension in quantifying the other blood components. *(Asian Journal of Applied Sciences 2 (3): 253-274, 2009;* **Doi:** *10.3923/ajaps.2009.253.274)*

A Novel Fast and Efficient Evolutionary Method for Optimal Design of Proportional Integral Derivative Controllers for Automatic Voltage Regulator Systems

S.M.A. Mohammadi, A.A. Gharaveisi and M. Mashinchi

An efficient and powerful design method for calculating optimal Proportional-Integral-Derivative (PID) controllers for AVR systems is proposed. The method is an improved version of the Discrete Action Reinforcement Learning Automata (DARLA) while discrete probability functions (DPF) of the design variables are not considered independent. The results of the proposed method called Extended Discrete Action Reinforcement Learning Automata (EDARLA) are compared to the results obtained by the well known Ziegler-Nichols (ZN), conventional DARLA and Genetic Algorithms (GA) and conventional CARLA approaches. The extensive simulation results prove superiority of the proposed design method in terms of optimality, efficiency, computation burden and being less sensitive to the ranges considered for the design variables that is the search space. Besides being successful in providing globally optimal results, due to high efficiency and lower computation time, the proposed approach can be considered an interesting candidate for designing and tuning optimal adaptive PID controllers for many practical systems. *(Asian Journal of Applied Sciences 2 (3): 275-295, 2009;* **Doi:** *10.3923/ajaps.2009.275.295)*

Analysis of Capacitance Networks

J.H. Asad

This study showed that infinite two dimensional (i.e., 2D) complex networks consisting of identical capacitors each with capacitance 1-farad can be analyzed using basic concepts of physics rather than using complicated principles. In this study the equivalent capacitance between adjacent nodes of a square infinite network consisting of identical capacitors each of 1-farad capacitance is determined. The method is applied also to other networks (i.e., triangular, honeycomb and kagome networks). *(Asian Journal of Applied Sciences 2 (3): 296-299, 2009;* **Doi:** *10.3923/ajaps.2009.296.299)*

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Strontium Sulphate Scale Formation in Oil Reservoir During Water Injection at High-Salinity Formation Water

A.B.B. Merdhah and A.A.M. Yassin

This study was conducted to investigate the permeability reduction caused by deposition of strontium sulphate in sandstone cores from mixing of injected sea water and formation water that contained high concentration of strontium ion at various temperatures (50 -80°C) and differential pressures (100-200 psig). The solubility of strontium sulphate scale formed and how its solubility was affected by changes in salinity and temperatures (40-90°C) were also studied. The morphology and particle size of scaling crystals formed as shown by Scanning Electron Microscopy (SEM) were also presented. The results showed that a large extent of permeability damage caused by strontium sulphate that deposited on the rock pore surface. The rock permeability decline indicates the influence of the concentration of strontium ions. At higher temperatures, the deposition of $SrSO_4$ scale increases since the solubility of $SrSO_4$ scale decreases with increasing temperature. The deposition of $SrSO_4$ scale during flow of injection waters into porous media was shown by Scanning Electron Microscopy (SEM) micrographs. The results were utilized to build a general reaction rate equation to predict $SrSO_4$ deposition in sandstone cores for a given temperature, brine super-saturation and differential pressures. *(Asian Journal of Applied Sciences 2 (4): 300-317, 2009;* ***Doi:*** *10.3923/ajaps.2009.300.317)*

Modeling of a Spark Ignition Engine Combustion: A Computational and Experimental Study of Combustion Process Effects on NO_x Emissions

R. Mobasheri, Y. Fotrosy and S. Jalalifar

In this study, the simulation results obtained by using the AVL FIRE code for a spark ignition (SI) engine are compared with experimental data. Computational fluid dynamics (CFD) is able to significantly reduce the number of experimental tests and measurements and lower the development time and costs. However, some parameters which are needed for CFD calculation must be achieved experimentally such as turbulence length scale. The CFD simulations demonstrated good agreement to the measured data. The Results show that, applying appropriate constants of each combustion model including eddy break up model (Ebu), probability density function (PDF) and coherent flamelet model (Cfm) causes the computational results to be in agreement with experimental results.

Furthermore the results show that the nearest prediction in comparison with experimental results is by applying the Ebu model. *(Asian Journal of Applied Sciences 2 (4): 318-330, 2009;* **Doi:** *10.3923/ajaps.2009.318.330)*

Studies on Granite and Marble Sawing Powder Wastes in Industrial Brick Formulations

S. Dhanapandian and B. Gnanavel

The main aim of this research is to study the utilization potential of granite and marble sawing powder wastes as alternative raw materials in the production of bricks. To safeguard the environment, efforts are being made for recycling different wastes and utilize them in valuable applications. Granite and marble sawing powder wastes is widespread by-product of industrial processes in India. Generally these wastes pollute and damage the environment due to sawing and polishing processes. Granite and marble wastes were collected from companies located in Salem District, Tamilnadu, India. Local clay and fired industrial brick samples were collected from nearby district namely, Erode, Tamilnadu, India. Mixtures were prepared with amounts of 0, 10, 20, 30, 40 and 50 wt. % of wastes incorporated into the raw clay and then fired at temperatures from 500 to 900°C in steps of 100°C in an electric furnace. Their characterizations were carried out with the determination of particle size, chemical composition, plasticity, XRD, SEM and Mossbauer spectroscopy. The technological properties such as compressive and flexural strengths, water absorption, porosity and bulk density were determined. The results showed that the granite and marble wastes can be added to the clay material with no determinal effect on the properties of the sintered bricks anticipating no costly modifications in the industrial production line. *(Asian Journal of Applied Sciences 2 (4): 331-340, 2009;* **Doi:** *10.3923/ajaps.2009.331.340)*

Preparation of Organic Solvent/Surfactant-Free Microspheres of Methoxy Poly(Ethylene Glycol)-*b*-Poly(∈-Caprolactone) by a Melt Dispersion Method

Yodthong Baimark

Aim of this research is to prepare organic solvent and surfactant-free microspheres of biodegradable methoxy poly(ethylene glycol)-*b*-poly(∈-caprolactone) diblock copolymer. The microspheres were produced in 90-100°C glycerol by melt

dispersion method. Morphology of the microspheres was spherical in shape with rough surfaces. Almost microspheres were in the size range of 300-500 μm. Microsphere cross-sections showed condensed phases throughout the microsphere matrices. Melting temperatures and heats of melting of the MPEG-*b*-PCL were decreased in the microsphere form. In conclusion, the use of melt dispersion method results in organic solvent and surfactant-free biodegradable microspheres of diblock copolymer that showing a potentially useful drug delivery systems with free from surfactants and organic solvents. *(Asian Journal of Applied Sciences 2 (4): 341-347, 2009;* **Doi:** *10.3923/ajaps.2009.341.347)*

Effect of Dynamic Analysis and Modal Combinations on Structural Design of Irregular High Rise Steel Buildings

B.J. Alsulayfani and T.E. Saaed

The aim of this study is to determines the effects of methods of analysis used in the analysis and design of high rise steel buildings. As it known, many methods are available for the structural analysis of buildings and other civil engineering structures under seismic actions. The differences between them lie in the way they incorporate the seismic input and in the idealization of the structure. There are two procedures for specifying seismic design forces: first, the equivalent static force and second, the dynamic analysis which can take a number of forms. Mode superposition is one of these forms. Design codes have proposed different formulas to obtain a more reasonable estimate of the maximum response from the spectral values (SRSS, CQC, ASCE-98, TEN, ABS, CSM). This research studies the effect of these formulas in the analysis and design of high rise reentrant steel buildings. The study then compares the resulting steel sections weight using static and dynamic analysis, the latter being by means of mode combination methods to show the difference between these formulas, to determine the most influenced structural members and to obtain the vertical loads factor in order to get the required sections using common static analysis for preliminary design purposes. The study shows that modal combination methods slightly affect the result of design for building; the difference among the formulas does not exceed more than 2.5%. The columns especially those at lower floors are mainly affected by seismic forces, while the beams are slightly affected. Finally, a factor of (10.5%) of the total vertical loads (excluding self weight of the building) can be used to predict the members sections, instead of dynamic analysis which is time consuming even with high speed computers like those used in this research. *(Asian Journal of Applied Sciences 2 (4): 348-362, 2009;* **Doi:** *10.3923/ajaps.2009.348.362)*

A Study of the Relative Levels and Factors in the Analysis of Total Ammonia Nitrogen in Some Surface and Groundwater Bodies of Swaziland

A.O. Fadiran and S.P. Dube

Water samples from selected surface water systems, namely three major rivers, three industrial discharges, one reservoir, one pond and tap water and groundwater systems made up of fifteen boreholes and shallow wells, were analyzed for ammonia (NH_3-N), using the UV spectroscopic (Salicylate) method. Pooled mean values (mg NH_3-NL^{-1}) are 0.14-0.29 for rivers, ponds, reservoirs and tap water; 14.80-16.70 for industrial effluents and 0.11-0.43 for the boreholes and shallow wells. These values are below the recommended maximum contaminant level (MCL) of <0.6 mg L^{-1}, by USEPA and SWSC (Swaziland Water Services Corporation), for drinking water 1.0 mg L^{-1} for rivers and the 22.8 mg L^{-1} by USEPA for industrial effluent. However, they all exceed the 0.02 mg L^{-1} MCL recommended by USEPA for fish heath and aquatic life in general, as well as the 0.1 mg L^{-1} for uncontaminated natural water. The most dominant factors considered in this study to have greatly influenced the levels of ammonia in both surface and groundwater samples analyzed include the degree of agricultural and industrial activities, population density, climate, rainfall pattern and soil/rock type in the area. More specifically the location (rural, sub-urban or urban) and depth are other factors that influence the ammonia levels in groundwater bodies. *(Asian Journal of Applied Sciences 2 (4): 363-371, 2009;* ***Doi:*** *10.3923/ajaps.2009.363.371)*

Optimization of Some Pre-treatments Involved in the Press Extraction of Shea (*Vitellaria paradoxa* Gaertner F.) Butter

A.M. Mohagir, R. Kamga, C. Kapseu and C.F. Abi

In this study, press extraction conditions of shea butter were optimized. Response Surface Methodology (RSM) using the Doehlert experimental design has been employed in the optimization. The independent variables considered were roasting time (0-90 min), grinding size (1-5 mm squared mesh), cooking time (0-180 min) and cooling time (0-60 min). The linear combination and quadratic effects of these variables on extraction yield, acid value, peroxide value and absorbance at 440 nm were investigated. The extraction yield was significantly influenced by cooking time and roasting time ($p < 0.001$). Acid value was significantly affected by all the mentioned parameters ($p < 0.05$), whereas peroxide value was significantly

influenced by grinding size (p<0.01), roasting time (p<0.001) and cooling time (p<0.01). The results revealed that the optimum conditions for extraction yield were grinding size 3.5 mm, cooking time 180 and 54 min cooling time. *(Asian Journal of Applied Sciences, 2 (4): 372-384, 2009;* **Doi:** *10.3923/ajaps.2009.372.384)*

New Perfobond Rib Connector Shapes

Ai Rong Chen and S.Y.K. Al-Darzi

The connection between steel and concrete aimed to be enhanced through investigating and developing the composite action affects on overall behavior of composite bridge. Among different types of connectors available today, the perfobond connector is suggested to enhance the connection properties. The push-out test is used to investigate the resistance capacity of the available regular perfobond connector. Several finite element models are developed and verified to simulate the push-out test specimen, shell element, solid element and bar element with both geometric and material nonlinearities. The verified finite element model is then used to test the applicability of the newly suggested connectors, replacing circular holes in the regular perfobond connectors by triangular one. The resistance capacities predicted for the newly suggested shapes seem to be close to that predicted from the regular perfobond connector. The results indicate that the new connector is applicable and supposed to be more reliable in steel-concrete composite structure, predicting more integrity between concrete. A recommendation on performing more studies on the newly suggested connectors are withdrawn due to the sensitivity of the connector to the dimension and shape of hole. *(Asian Journal of Applied Sciences, 2 (4): 385-393, 2009;* **Doi:** *10.3923/ajaps.2009.385.393)*

The Effect on Organic Agriculture of Insulation of Rural Houses in Turkey

Sirri Şahin and Abdurrahim Bolukbasi

This present study investigated how much energy and dung savings can be obtained with the insulation of rural houses. Energy savings and dung savings are calculated based on degree-days, fuel types and thermal resistance of walls. The results showed that by enveloping a rural house with proper insulation thickness, energy savings differ between 20 and 86% and payback periods differ between 0.52 and 4.64 years based on degree-days, fuel types and thermal resistance of

walls. When rural houses are optimally insulated, the dung savings are calculated as 3970 kton. In return, these savings can directly be used in organic farming. Therefore, insulation of rural houses is crucial for energy savings. *(Asian Journal of Applied Sciences, 2 (4): 394-401, 2009; **Doi**: 10.3923/ajaps.2009.394.401)*

Population Projection of Kerala using Bayesian Methodology

Rahul, Gyan Prakash Singh and Om Prakash Singh

This study considers use of Bayesian methodology for the population projection of an Indian Province, Kerala using logistic growth model. The study presents probabilistic projections of the population and estimates of the parameters of the model along with their highest posterior density intervals. Getting actual expressions of posterior distributions in Bayesian setup with large number of parameters is a difficult task. To overcome the problem, Markov Chain Monte Carlo (MCMC) technique has been used for getting samples from the posterior distribution. The projections have been compared with those made in earlier studies to check the suitability of the projections. We have also discussed the asymptotic behavior of population projection to know the total population at which Kerala population will be stabilized. *(Asian Journal of Applied Sciences, 2 (4): 402-413, 2009; **Doi**: 10.3923/ajaps.2009.402.413)*

Comparative Study of Synchronizing Unified Fractional Chaotic Systems

Somayeh Jokar

In this study nonlinear controller, active controller, unidirectional coupling controller and active sliding mode controller are designed for synchronizing pairs of unified fractional chaotic systems with known parameters different randomly selected initial conditions. These methods are compared from various points of views such as synchronization time, synchronization error, average synchronization time, average error variance, average squared error variance, average minimum control signal, average maximum control signal, minimum control signal variance and maximum control signal variance. As we know, nobody compares these methods for fractional chaotic systems, until now. Present results show that the active sliding mode controller is generally better than the others according to the defined criteria. *(Asian Journal of Applied Sciences 2 (5): 414-435, 2009; **Doi**: 10.3923/ajaps.2009.414.435)*

A New Roughened Bed Hydraulic Jump Stilling Basin

M. Shafai Bejestan and K. Neisi

The main goal of this study is to introduce a new roughened bed hydraulic jump stilling basin. To reach such idea, first a new expression was developed for sequent depth and hydraulic jump length. Then, hydraulic jumps were conducted on a bed of prismatic roughness elements in a rectangular flume in order to investigate the jumps' effects on the characteristics of stilling basins. The roughed elements are glued on the bed of the flume downstream of ogee spillways in such a way that the incoming water jet is just above the element surface. Each rough element shape was tested under different Froude numbers, ranging 4.5 to 12. During each test, the water surface profile, the roller length and the jump length were measured and the longitudes and vertical flow velocity were also measured in some tests. Applying experimental results, the shear force coefficient was found. The results indicate that the presence of a rough element can increase the shear force and, consequently, reduce the jump length and sequent depth of flow. Comparison of the results with previous studies shows that using the new roughened bed, the length of the basin can be decrease as low as 40% of the regular basins. *(Asian Journal of Applied Sciences 2 (5): 436-445, 2009; **Doi:** 10.3923/ajaps.2009.436.445)*

Fire Propagation and Strength Performance of Fire Retardant-Treated *Hibiscus cannabinus* Particleboard

K. Izran, A. Zaidon, A.M.A. Rashid, F. Abood, M.J. Saad, Mohd. Z. Thirmizir, Khairul Masseat and [1]S. Rahim

The fire propagation and strength performance of kenaf (*Hibiscus cannabinus*) core particle board treated with three different commercialized fire retardants were studied using ten percent concentration of fire retardants. The fire propagation test was evaluated using performance index (I), which indicates the heat release of the tested particle boards. Physical and mechanical properties such as water absorption, thickness swelling, Modulus of Rupture (MOR), Modulus of Elasticity (MOE) and Internal Bond (IB) of the treated and untreated boards were also studied. The study showed that diammonium phosphate (DAP) was excellent in reducing the heat release of the boards followed by monoammonium phosphate (MAP) and BP® [mixture of 27-33% boric acid, 67-73% guanylurea phosphate

and 0.0-4.2% phosphoric acid]. DAP and MAP were able to delay the maximum early heat release of the boards by about 15 to 16 min and 18 to 20 min, respectively compared to BP® which was only able to delay the maximum early heat release by about 10 to 15 min after ignition. The heat release of the DAP and MAP-treated particle boards started 5 min after ignition, but the heat release of the BP®-treated boards started from the beginning of the test. Boards treated with DAP were found comply with the standard ratings for thickness swelling and water absorption test. MAP-treated boards were found comply with the standard rating for MOR and were found to be the best compared to the other treated boards for MOE and IB. However, treated boards complied with the standard ratings of MOE and IB. *(Asian Journal of Applied Sciences 2 (5): 446-455, 2009;* ***Doi:*** *10.3923/ajaps.2009.446.455)*

Distribution of Organochlorine Pesticides in Human Breast Milk and Adipose Tissue from Two Locations in Côte d'Ivoire

A. Allé, A. Dembellé, B. Yao and G. Ado

The levels of organochlorine residues in 40 samples of milk and 20 human adipose tissues from two locations in the northern of Côte d'Ivoire were determined. A system of Gas Chromatography with an Electron Capture Detector (CG-ECD) was used for the qualitative and quantitative analysis of the samples. This study revealed in general that the level of pesticides in samples of adipose tissue was higher than that in samples of milk from any source (city or rural). Indeed, while the average of 2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane (DDT), predominant specie and its isomers in adipose tissue was 10.02 mg kg^{-1} in countryside and 6.93 mg kg^{-1} in the city, it was respectively 0.013 and 0.019 mg kg^{-1} in milk. Qualitatively, the pesticide residues detected in milk samples were Lindane, hexachlorohexane and its isomers, DDT and its metabolites, heptachlor, heptachlorepoxide, aldrin, endrin, dieldrin and endosulfan α and β. Adipose tissue samples revealed the presence of polychlorinated biphenyl (PCB), Hexachlorobiphenyl (HCB) in addition to pesticides which are found in the milk Average concentrations of organochlorine pesticides in milk matrix were above the Maximum Residue Limits (MRL) of WHO. Regarding adipose tissue, this trend was also observed, except for DDT and its metabolites whose values were far below the MRL. *(Asian Journal of Applied Sciences 2 (5): 456-463, 2009;* ***Doi:*** *10.3923/ajaps.2009.456.463)*

Forest Change Detection in the North of Iran using TM/ETM+Imagery

S. Smailpour Podeh, J. Oladi, M.R. Pormajidian and M.M. Zadeh

Spatial and temporal dynamics of land use/land cover changes were quantified using TM/ETM+images. Time series were selected for forest cover change evaluate in the North of Iran in 1989-2000. In this study, we used a supervise classification algorithm and five techniques based on thresholding involved radiance/reflectance band differencing, NDVI differencing, tasseled cap, change vector differencing and NDVI ratio. Between five change detection approaches, NDVI differencing approach was the best method for changes detecting occurred in the study area. According to measurements from satellite images, 4843.42 ha were detected in this area in 1989-2000. Man-made expansion in the forest North of Iran has been largely derived by population growth and economic development. Land use maps produced will contribute to both the development of sustainable management land use planning decisions and also for forecasting possible future changes in growth patterns. There is a merit to each of the several land use change detection methods studied and appears to be no single best method in which to perform change analysis. The resulting different spectral response of types of disturbances can be used to classify and forecast natural and man made disturbances and artificial neural network or knowledge-based expert offer further opportunities. *(Asian Journal of Applied Sciences 2 (6): 464-474, 2009;* ***Doi:*** *10.3923/ajaps.2009.464.474)*

Design, Fabrication and Testing of a Swirl Burner for Alpha V-Shaped Stirling Engine

I.M. Yusof, N.A. Farid, Z.A. Zainal, G.B. Horizon, K. Noriman and A. Miskam

This study presents the design, fabrication and testing of a swirl burner that was used as part of the heater head section for a 194 cc. V-Shaped alpha stirling engine. The incorporation of a swirl burner with a stirling engine fulfilled its multi-fuel characteristic, since a hot producer gas from a gasification or combustion of any source of fuel can be utilized including biomass. The swirl burner with two heat input channels was designed based on the swirl number, S, which was calculated as 19.6. The swirl burner was made of 4 mm of mild steel and internally covered with 10 mm of cement. The flare from the mixture of air and Liquefied Petroleum Gas (LPG) was torched through the primary inlet and swirled uniformly through the area of an annulus in between the hot working cylinder and the outer swirl burner. The flame temperature inside the swirl burner was found to exceed 1000°C and produced the hot temperature up to 770°C. The required hot

temperature inside the stainless steel expansion-working cylinder of 550 and 650°C was realized by the swirling effect of the flare inside the burner. Like a swirl combustor, the mathematical equation of the swirl number, S was found to be applicable to the swirl burner with the swirling effect only at the area of an annulus. The hot temperature increased with the increase of heater temperature inside the swirl burner and improved the expansion process. *(Asian Journal of Applied Sciences 2 (6): 475-485, 2009; **Doi:** 10.3923/ajaps.2009.475.485)*

A Study of Rainfall Forecasting Models Based on Artificial Neural Network

Karim Solaimani

The present study aims to utilize an Artificial Neural Network (ANN) to modeling the rainfall-runoff relationship in a catchment area located in Iran. The study illustrates the applications of the feed forward back propagation for the rainfall forecasting with various algorithms with performance of multi-layer perceptions. The type of used data in ANN environment was 17 years monthly hydrometric and climatic data. For the operated model 14 years but for the validation/testing of the model 3 years data was applied. The results of this study explored that the capabilities of ANNs and the performance of this tool would be compared to the conventional approaches used for stream flow forecast. The estimated statistical results of the Root Mean Square Error (RMSE) and coefficient of determination (r) measures were calculated foe the used models of 1, 2 and 3 consequently: 2.5, 0.47; 1.57, 0.96; 0.2, 0.998. The results extracted from the comparative study indicated that the Artificial Neural Network method is more appropriate and efficient to predict the river runoff than classical regression model. Efficiency of the used model 1 is facilitated for regular temperature data as input component with using two stations, model 2 for precipitation with using five stations and model 3 for rainfall, average temperature and flow data as participation with using six stations. It is concluded that model 3 provided more accurate and satisfied results than the other used models. *(Asian Journal of Applied Sciences 2 (6): 486-498, 2009; **Doi:** 10.3923/ajaps.2009.486.498)*

Optimization of a Quadratic Function under its Canonical Form

A. Chikhaoui, B. Djebbar, A. Belabbaci and A. Mokhtari

The aim of this study is to find the exact solution of a quadratic programming problem with linear constraints of an objective quadratic function written in the canonical form. This study describes a new method which is based on splitting the

objective function into the sum of two functions, one concave and the other convex; a new feasible constraint set is built by a homographic transform, in such away that the projection of the critical point of the objective function onto this set, produces the exact solution to the problem on hand. Notice that one does not need to transform the quadratic problem into an equivalent linear one as in the numerical methods; the method is purely analytical and avoids the usage of initial solution. The technique is simple and allows us to find the coefficients of the convex function while moving from one summit to another. The proved theorem is valid for any bound, closed and convex domain; it may be applied to a large number of optimization problems. The obtained results are of great importance to solve separable programming cases. *(Asian Journal of Applied Sciences 2 (6): 499-510, 2009; **Doi:** 10.3923/ajaps.2009.499.510)*

VHO Strategy for QoS-Provisioning in the WiMAX/WLAN Interworking System

Omar M. Eshanta, M. Ismail, K. Jumari and P. Yahaya

In IEEE 802.16, one of the main features is the QoS-Provisioning. The limited bandwidth and the increasing of the high data rate service users will impact the performance of the system. In this study, we propose a VHO algorithm that can support the provisioning of QoS in mobile WiMAX networks by handing over some Best-Effort (BE) low-speed WiMAX Subscriber Station (SS) to an overlaid WLAN network subject to the QoS guarantee for the SS. Our simulation results show that by utilizing the overlaid WLAN hotspots we can gain some free band for the new SS requests. According to our simulation results a significant improvement in the capacity and the probability of blocking (PB) in WiMAX network was achieved. *(Asian Journal of Applied Sciences 2 (6): 511-520, 2009; **Doi:** 10.3923/ajaps.2009.511.520)*