

BULETINUL ȘTIINȚIFIC
al Universității “Politehnica” din Timișoara, Romania
SCIENTIFIC BULLETIN OF
“Politehnica” University of Timișoara, Romania

Contents and abstracts

Seria MATEMATICĂ - FIZICĂ
Transactions on MATHEMATICS & PHYSICS
Tom 54(68), Fascicola 2, 2009, ISSN 1224-6069

MATHEMATICS

1. *D. KUMAR - On the proximate type and $\lambda - \text{proximate}$ type of generalized biaxially symmetric potentials having index $-q$ 1*
2. *M. BAICA and M. CÂRDU - Paratrigonometric functions relative to the finite spirals as the basic trigonometric figures 9*
3. *D. DĂIANU - On the fréchet polynomials 18*
4. *G. BABESCU, A. JURATONI, O. BUNDĂU - On the solving of the heat equation With variable conductivity and source 27*
5. *A. ARON and C. POP - Lax formulation and kahan's integrator for rikitake Two disk dynamo system..... 34*
6. *C. C. VASII - A heat equation for the volume entropy of a riemannian metric evolving by the ricci flow 40*

PHYSICS

7. *V. L. CARTAS - The Diagramatic Quantum Computing with Anyons 43*
8. *I. DAMIAN, I. LUMINOSU, M. COSTACHE, M. CRISTEA - Application of a simple model for the daily global solar irradiation 50*
9. *O. LIPAN - The α -function for the harmonic oscillator 56*
10. *N. POP, D. POPOV, V. CHIRIȚOIU - Quantum information in terms of the coherent states representation of the density operator 62*
11. *G. MURARIU - On the evaluation for energy-momentum tensor in curved space-time..... 68*
12. *G. MURARIU , M. A. DARIESCU, C. DARIESCU - First order solutions for boson fields system equations 75*

**ON THE PROXIMATE TYPE AND λ – PROXIMATE TYPE
OF GENERALIZED BIAXIALLY SYMMETRIC
POTENTIALS HAVING INDEX -q**

Devendra KUMAR

Abstract. To obtain more refined measure of growth the q-proximate type is constructed for a class of generalized biaxially symmetric potentials (GBASP). Finally, we obtain lower q-proximate type for GBASP. Our results of Kumar [3].

Address: **Devendra KUMAR**, Department of Mathematics Research and Postgraduate Studies
M.M.H. College Ghaziabad-201001, U.P. India d_kumar001@rediffmail.com

**PARATRIGONOMETRIC FUNCTIONS RELATIVE TO THE FINITE SPIRALS AS
THE BASIC TRIGONOMETRIC FIGURES**

Malvina BAICA and Mircea CÂRDU

Abstract. In this paper we will examine the paratrigonometric functions, which are in relation with the Basic Trigonometric Figures (BTFs) of the finite spiral form developed in the trigonometric sense between the value of the vector radius ρ , from $\rho = 1$ to $\rho = 0$. The corresponding functions were defined “the spiral paratrigonometric Sinus of the angle α ” (denoted $Sps\alpha$), „the spiral paratrigonometric Cosine of the angle α ” (denoted $Cps\alpha$) etc.

It is worth to notice the similarity of the mathematical expression for the function $Cps\alpha$ referred to the logarithmic Spiral as BTF, with the elongate equation for the amortized mechanical vibration.

Address: Malvina Baica, The University of Wisconsin, Dep.of Mathematical and Computer Sciences
Whitewater, WI. 53190 U.S.A., E-mail: baicam@uww.edu

Mircea Cârdu, S.C.HERBING S.R.L., 9 Otetari Str., Sector 2, Bucharest, Romania. E-mail:
mircea.cardu@herbing.ro

ON THE FRÉCHET POLYNOMIALS

Dan DĂIANU

Abstract. Combinatorial properties of the difference morphism D^n and the behaviour of monomials under the action of D^n are studied in this paper.

Address: Dan DĂIANU, “Politehnica” University of Timișoara, Department of Mathematics, P-ța. Victoriei, No.2, Et. 2, 300006 – Timișoara, ROMÂNIA, email: dan.daijanu@mat.upt.ro

ON THE SOLVING OF THE HEAT EQUATION WITH VARIABLE CONDUCTIVITY AND SOURCE

Gheorghe BABESCU, Adina JURATONI, Olivia BUNDĂU

Abstract. In this paper we study the applications for some equations of mathematical physics using the Laplace transform and we give an example in this sense.

Keywords: Laplace transform, heat equation.

Address: G. BABESCU, A. JURATONI, O. BUNDĂU, „Politehnica” University of Timișoara, Department of Mathematics, P-ța. Victoriei, No. 2, Et. 2, 300006 – Timisoara, ROMANIA

LAX FORMULATION AND KAHAN’S INTEGRATOR FOR RIKITAKE TWO DISK DYNAMO SYSTEM

Anania ARON and Camelia POP

Abstract. Lax formulation and numerical integration via Kahan’s integrator for a classical dynamical system is introduced and some of its properties are pointed out.

Address: A.Aron and C. Pop, „Politehnica” University of Timișoara, Department of Mathematics, P-ța. Victoriei, No. 2, Et. 2, 300006 – Timisoara, ROMANIA

A HEAT EQUATION FOR THE VOLUME ENTROPY OF A RIEMANNIAN METRIC EVOLVING BY THE RICCI FLOW

Cătălin C. VASII

Abstract. The volume entropy of a Riemannian Metric is closely related to the notion of a collapsing solution to the Ricci Flow. In this paper, by deriving a heat equation for the volume

entropy and applying a maximum principle, it is given a sufficient condition for the volume entropy to be nondecreasing in terms of riemannian geometry data. The evolution of the volume entropy under the normalized Ricci flow on a surface has been studied by A. Manning in [MANN].

Address: **Cătălin C. VASII** - „Politehnica” University of Timișoara, Department of Mathematics, P-ța. Victoriei, No. 2 ,Et. 2, 300006 – Timisoara, ROMANIA, email adress: catalin.vasii@mat.upt.ro

Physics

The Diagramatic Quantum Computing with Anyons

Viorel Laurentiu CARTAS

Abstract: Two cases of quantum links are emphasized , considering two and three anyons .In the first case a two qubits register is attached. The unitary transformation (e.g. the U_{CNOT} unitary transformation) can map not-entangled quantum states to the quantum and topological entangled states, as there are highlighted in this paper for the two anyons link case.

The six qubit register which is attached to the three anyons link is only shortly presented since it represents a work in progress. The topologic and quantum states are represented by ket vectors and correspondingly by diagrams.

Address: **Viorel Laurentiu CARTAS**, Catedra Științe Fundamenatale, Facultatea de Inginerie Brăila, Calea Călărași nr.29, BRĂILA, Cartas.Viorel@ugal.ro

APPLICATION OF A SIMPLE MODEL FOR THE DAILY GLOBAL SOLAR IRRADIATION

Ioan DAMIAN, Ioan LUMINOSU, Marius COSTACHE, Minerva CRISTEA

Abstract: A simple model for simulation of the daily global solar irradiation is presented and the prediction of the model is compared with the measured data for Timișoara. The calculated monthly global solar irradiation is also compared with the measured monthly data and with the average monthly values presented in literature. One can conclude that the agreement is satisfactory.

Key words: Global solar radiation, daily solar radiation model

Address: Ioan DAMIAN, Ioan LUMINOSU, Marius COSTACHE, Minerva CRISTEA, Department of Physical Basis of Engineering, „Politehnica” University, Timișoara, România, ijdamian@yahoo.com

THE A-FUNCTION FOR THE HARMONIC OSCILLATOR

Ovidiu LIPAN

Abstract. The A-function is roughly the Laplace transform of the Wey-Titchmarsh m-function. For a Schrödinger equation, the potential determines the A-function. In this note the A-function for the harmonic oscillator is studied.

Address: Ovidiu LIPAN, Department of Physics, University of Richmond 28 Westhampton Way, Richmond, VA 23173, U.S.A. olipan@richmond.edu

QUANTUM INFORMATION IN TERMS OF THE COHERENT STATES REPRESENTATION OF THE DENSITY OPERATOR

Nicolina POP, Dușan POPOV, Viorel CHIRIȚOIU

Abstract: In quantum mechanics, a coherent state is a particular state of a quantum mechanical oscillator, useful in many areas, particularly in quantum optics. In this paper, the notions of a qubit and density operators are cast in the framework of coherent states. First, we express a qubit, the fundamental unit in quantum information, as a coherent state, and thus a sequence of qubits is a tensor product of coherent states. Then we switch to the density operator picture and show that once the density operator is written in terms of coherent states, the diagonalization of the density operator in the coherent state representation is useful for studying entanglement.

Address: Nicolina POP, Dușan POPOV, Viorel CHIRIȚOIU, “Politehnica”, University of Timișoara, Department of Physical Foundations of Engineering, B-dul V. Parvan No.2, Timișoara, RO-300223, ROMANIA, nicolina.pop@et.upt.ro, dusan_popov@yahoo.co.uk, viorel.chiritoiu@et.upt.ro

ON THE EVALUATION FOR ENERGY-MOMENTUM TENSOR IN CURVED SPACE-TIME

GABRIEL MURARIU

Abstract: One of the most interesting problem which remains unsolved, since the birth of General Theory of Relativity (GR), is the energy-momentum localization. All our considerations are within the Lagrange formalism of field theory. The concept of the energy-

momentum tensor for gravitational interactions has a long history. To find a generally accepted expression, there have been different attempts. This paper is devoted to the investigation of the energy-momentum problem in the General Relativity theory. We use Einstein [1], Landau-Lifshitz [2] and Bergmann-Thomson [3] prescriptions to evaluate energy-momentum distribution. In order to cover the huge volume of computation and, bearing in mind to make a general approaching for different space-time configurations, was built a MAPLE application to succeed in studying the energy momentum tensor. In the second part of the paper were presented for one space-time configuration, the obtained results.

Key words: energy momentum tensor, scalar field, electromagnetic field.

Address: **GABRIEL MURARIU**, Faculty of Sciences, University “Dunărea de Jos”, Galați, Domnească Street, no.111, Romania, E-mail: gabriel.murariu@ugal.ro

FIRST ORDER SOLUTIONS FOR BOSON FIELDS SYSTEM EQUATIONS

G. MURARIU , M. A. DARIESCU, C. DARIESCU

Abstract: Four correlations for estimating diffuse solar irradiation on an inclined plane are compared statistically to test their applicability in Western Romania, with the aim to recommend the model that are most suited for the region.

Address: **G. MURARIU**, Faculty of Sciences, University “Dunărea de Jos”, Galați, Domnească Street, No.111, România, E-mail: Gabriel.Murariu@ugal.ro

M. A. DARIESCU, C. DARIESCU,² Faculty of Physics, University “Alexandru Ioan Cuza”, Iași, Carol Boulevard, No.11, România