Summaries

UDC 519.2

Karpov I.G., Gribkov A.N.
ON THE ISSUE OF ASYMPTOTIC APPROXIMATIONS ACCURACY OF BERNOULLI'S FORMULA

The authors have proposed the expressions for approximation of Bernoulli's formula. These expressions allow determining more precisely the probability of event A occurrence k times at large number of independent trials if the event A occurs in each of them at probability p.

Rozhkova S.V.
OPTIMAL SIGNAL TRANSMISSION ALONG THE CONTINUOUS AND DISCRETE CHANNELS WITH MEMORY AND DELAY

The article considers the task of optimal transmission of stochastic processes along the continuous-discrete channels with memory and delay. The authors have proved the extremum properties of optimal coding in terms of information maximization.

UDC 519.63

Zimin V.P.
THE RESEARCH OF FEATURES OF PLASMA BOUNDARY CONDITIONS IN EMITTER FOR THERMIONIC DIODE

The author has analyzed the model of the monotonous plasma boundary conditions for emitter of thermionic diode on the planes plasma density–ion current, plasma density–electron energy density and the others. The features of changing the boundary conditions curves were studied; their typical behavior was classified. The article introduces the method for estimating the typical kind of boundary conditions and their change at variation of a diode and plasma parameters.

UDC 519.872

Moiseev A.N., Nazarov A.A.
THE RESEARCH OF HIGH–INTENSTY MAR–ARRIVAL PROCESS

The paper introduces the research of MAR-arrival process having high conditional intensities of event occurrence. It is shown that the number of events occurred in such arrival process for the fixed time interval is normal in asymptotics (under condition of unconstrained intensity growth). The characteristics of this distribution were obtained.

UDC 519.872

Nazarov A.A., Moiseeva E.A.
THE RESEARCH OF RQ–SYSTEM BY MMPP|M|1 METHOD OF ASYMPTOTIC ANALYSIS AT HEAVY LOAD

The authors have studied the mathematical model of MMPP|M|1 system with the source of repeated calls by the method of asymptotic analysis at heavy load. The obtained distributions of probabilities of order amount in the source of the repeated calls were compared with limiting distribution obtained by numerical methods. It demonstrated the acceptability of using the proposed asymptotic method.

UDC 514.763

Al–Khassani M.A., Moldovanova E.A.
AFFINE SPACE MAPPING TO THE ZERO–PAIR VARIETY OF THE PROJECTIVE SPACE

The differentiable mappings of affine space to the varieties of all nondegenerate and all degenerate zero-pairs of the projective space have been studied. The bind between these mappings is considered.

UDC 517

Churikov V.A.
EXPONENTIAL DEGENERATION IN CASE OF NOT–INTEGRAL ORDERS IN LOCAL FRACTIONAL ANALYSIS BASED ON d-OPERATOR

The article introduces and considers the properties of exponents in fractional analysis of not-integral orders. It is shown that degeneration of various degrees is possible for not-integral orders in different cases when there is more than one exponent for various orders. It was obtained that the number of exponents for rational orders is finite and it is infinite for irrational ones.

UDC 517.3

Churikov V.A.
INTEGRATION AND DIFFERENTIATION OF BINOMIAL DECOMPOSITIONS IN LOCAL FRACTIONAL ANALYSIS

The paper considers the integro-differentiation of binomial decompositions in local fractional analysis based on d-operator.

UDC 530.145

Breev A.I.
METHOD OF GENERALIZED ZETA–FUNCTION FOR SCALAR FIELD ON HOMOGENEOUS SPACES WITH INVARIANT METRIC AND ZERO DEFECT

Using the orbits method the author has found out the expression for local zeta-function of Clein–Gordon operator on static homogeneous spaces with invariant metric and zero defect. Within the method of the generalized zeta-function the vacuum means of energy momentum tensor of scalar field were calculated.

UDC 621.313: 519.688

Khokhlova T.E., Glazyrin A.S., Polishchuk V.I.
ESTIMATION OF RL–CHAIN PARAMETERS IN ELECTRO–MECHANICAL SYSTEMS IN OPERATING MODE BASED ON THE COORDINATE–WISE DESCENT TECHNIQUE

The authors have proposed the algorithm of parametric identification of RL-chains in electromechanical systems in operating mode. It is not necessary to interrupt the system regular operation due to initial condition synchronization in this algorithm. The algorithm is based on the technique of coordinate-wise descent and allows obtaining the estimates of the object model parameters so that the output signals mismatch is minimum. The algorithm operation was studied on the laboratory setup.

UDC 621.391

Karpov I.G., Zyryanov Yu.T., Gribkov A.N.
JOHNSON'S MODIFIED DISTRIBUTIONS AND THEIR APPLICATION FOR APPROXIMATION OF DISTRIBUTION LAWS OF THE EXPERIMENTAL DATA

The authors have proposed Johnson's modified distributions for approximation of distribution laws of the experimental data taking only positive values. The technique for estimating the parameters of Johnson's modified distributions by the experimental data was developed.

UDC 621.313: 519.688

Bolovin E.V., Glazyrin A.S.
THE METHODS FOR INCREASING MATRIX CONDITIONALITY WHEN SOLVING THE DIFFERENCE EQUATIONS SYSTEMS IN PROBLEMS OF IDENTIFICATION OF DYNAMIC OBJECT PARAMETERS

The authors have developed the algorithm for identifying the dynamic object parameters at the harmonic input effects based on the

solution of the difference equations systems. The technique of time coefficient selection when generating the difference equations was proposed and tested. The main methods for improving the conditionality of the input values matrix were considered and proposed.

UDC 539.219.3:546.82

Grabovetskaya G.P., Nikitenkov N.N., Mishin I.P., Dushkin I.V., Stepanova E.N., Sypchenko V.S.
HYDROGEN DIFFUSION IN SUBMICROCRYSTALLINE TITANIUM

The authors have carried out the comparative studies of hydrogen diffusion in coarse- and submicrocrystalline titanium by the method of electrolytic cell conjugation with vacuum chamber through the membrane. It was ascertained that the formation of submicrocrystalline structure results in decrease of effective coefficient of hydrogen diffusion in titanium and increase of capacity to accumulate hydrogen in the volume. It is conditioned by large extension of grain boundary in submicrocrystalline samples in comparison with the coarse-crystalline ones. The authors have analyzed the influence of dislocation density and grain boundary extension on titanium capacity to accumulate hydrogen in the volume.

UDC 621.385.69

Grigoryev V.P., Timofeev A.A., Grigoryev A.V.
THE THEORY OF ELECTROMAGNETIC OSCILLATION EXCITATION IN COAXIAL REFLECTIVE TRIODE WITH RADIATE BEAM

The authors study the mechanism of electromagnetic oscillations radiation in cylindrical triode with virtual cathode with radiate beam by the method of kinetic equation. Spectrum and increment of the excited oscillations were determined and the expression for radiation efficiency was obtained. The radiation efficiency on the type of the excited oscillations and system parameters was analyzed. The paper demonstrates that the lower oscillation modes are mostly excited in the coaxial triode. The most efficient excitation of electromagnetic oscillations occurs on TEM-mode.

UDC 620.17

Ismailov G.M., Pavlov M.S., Tyurin A.E.
ESTIMATION OF SHIFTING EFFORTS OF ELEMENTS IN MULTICORE CABLE AT BEND DEFORMATIONS

The paper considers the issues of assessment of elements power interaction in cable structures at bend deformations. The authors have obtained the expressions for estimating the value of shifting efforts occurring at winding in multicore cables on the basis of multicore cable representation as a compound core with absolutely rigid cross-section bonds.

UDC 530.1:519.2:681.5

Deeva V.S., Romanishina S.A., Slobodyan S.M.
STABILITY OF ENTROPY ESTIMATION OF SYSTEM VITALITY

The authors have determined the connection of reliability variation estimation for separate elements and the system itself or the device with entropy as a measure for evaluating the system state uncertainty caused by a number of random operational occurrences of their functioning at practical application. On the assumption of validity of exponential probability law of time to system failure it was determined that the range of entropy estimation values for various types of elements, nodes, devices is in a certain range of variation interval of entropy index level similar to the chaotic Hurst coefficient.

UDC 621.313:534

Deeva V.S., Slobodyan S.M.
DESTRUCTION OF SLIDING LAMELLAR CONTACT

The authors have proposed the probabilistic approach to the description of dynamics in destruction of bodies contact pair when one body is sliding over infinite periodic surface of the other. The possibility of solving the problem of accurate estimation of collectors vitality was analyzed. The Markovian model of collector wear at sliding over collector lamella was proposed.

UDC 535.36

Goryachev B.V., Mogilnitsky S.B.
OPTICAL RADIATION TRANSFER IN LAYERED DISPERSION MEDIA WITH REFLECTIVE SURFACE

The article considers the radiation transfer in two-layered dispersion media with reflective surface. The analytical expressions for determining radiation balance characteristics were obtained. It was shown that the ground layer even at low optical density and its weak change affects considerably on reflectivity of the system «two-layered media−reflective surface» at all the values of reflection coefficient of underlying surface. It was ascertained that the growth ground layer optical density at absorption results in almost compete absorbance independence of the system «two-layered media−reflective surface» on reflection coefficient of the underlying surface.

UDC 539.3

Bochkareva S.A., Reutov Yu.A.
THE RESEARCH OF STRESS−STRAIN STATE OF MULTILAYER POLYMER PIPES BY THE FINITE ELEMENT METHOD

The authors have specified the relevance of estimating the stress-strain state of polymer material pipelines by the numerical techniques. Three-layer reinforced polymer pipe was calculated by the finite element method using the deformation-strength properties of the layers. The graph of distribution of equivalent stresses and movements were obtained. The article introduces the description of the developed algorithm of problem numerical implementation and comparison of program operation results with the existing analytical solutions. The computation was repeated in software ANSYS to check the results reliability. The conclusion was made on viability of the method application.

UDC 535.211

Makenova N.A., Dzhuraev R.F.
WAVEFRONT REVERSAL USING AMPLITUDE TRANSPARENCY

The paper considers the wavefront reversal using amplitude transparency (modulator). As a result of numerical investigations it is shown that almost full compensation of turbulent distortions is achieved in spite of considerable energy absorption by modulator.

UDC 534.2

Provotorov D.S., Solovyev A.V., Vinogradov Yu.A.
AMPLITUDE−FREQUENCY CHARACTERISTICS OF LAND EXPLOSION INFRASOUND SIGNALS

The authors have determined the amplitude-frequency characteristics of infrasound signals generated by land explosion. The acoustic signal directions of arrival were determined by triangulation method. The signals indicate the source of explosive works. The use of wavelet transform with Morlet basic function allowed definitely identifying low-frequency land explosions acoustic signals.

UDC 621.384.6

Egorov I.S., Kaykanov M.I., Remnev G.E.
EXIT WINDOW OF HIGH−CURRENT ACCELERATOR OF ASTRA ELECTRONS

The article introduces the results of researches of injecting high current pulsed electron beam into atmosphere at repetition to 50 pulse/sec. with electron energy 300...350 keV, current to 0,6 kA, pulse duration of beam current 120 nsec. The authors have determined the energy of injected electron beam for constructions of exit window with and without supporting grid. Thermal operating conditions for the mentioned exit window constructions were analyzed.

UDC 533.9.01

Lutsenko Yu.Yu., Zelenetskaya E.P., Vlasov V.A.
SKIN EFFECT INFLUENCE ON ELECTRODYNAMIC CHARAC-TERISTICS OF HIGH−FREQUENCY TORCH DISCHARGE

The paper considers the solution of electrodynamic problem for high-frequency torch discharge at pronounced skin effect considering radial inhomogeneity of its channel. The authors have detected the shift

of magnetic field maximum in discharge plasma along radial coordinate at skin effect strengthening. The wave number of electromagnetic wave propagating along the torch discharge channel was calculated. It was shown that the ratio of attenuation coefficient to phase coefficient of electromagnetic wave increases at skin effect strengthening.

UDC 621.51

Filipas A.A., Osinenko V.V., Kladiev S.N., Fomin A.A.
ESTIMATION OF ELECTRIC DRIVE LOAD CHARACTERISTICS IN ANGLE COMPRESSOR

The authors have proposed the algorithm of estimating parameters and characteristics of angle reciprocating compressor as a specific load of controlled electric drive on the basis of kinematic scheme analysis. The obtained load characteristics are used for refined selection of controlled electric drive power.

UDC 669.337

Karimova L.M., Kayralapov E.T.,
Zhumashev K.Zh., Tokbulatov T.E.
MATHEMATICAL DESCRIPTION OF THE RESULTS OF STUDYING DRYING OF GRANULATED ROUGH COPPER–MOLYBDENUM CONCENTRATE OF «TASTAU» DEPOSIT

The article introduces the results of the research of drying being a part of the technology which includes the granulation of rough copper-molybdenum concentrate of «Tastau» deposit. The authors have obtained the mathematical models describing dehydratation laws and changes of material properties at thermal treatment. The controlled parameters were the relative mass loss at drying, at subsequent additional granule drying, the degree of their dehydratation. It was ascertained that the characteristics of phase composition affect the results of their subsequent treatment. The specific character of the material determines also the selection of firing and leaching combination using which it became possible to achieve a certain goal – the most complete extraction of copper and molybdenum.

UDC 621.791.92

Gnyusov S.F., Durakov V.G.
STRUCTURIZATION OF COMPOSITION COATINGS «STEEL R6M5 – (WC+TiC)» DEPENDING ON TUNGSTEN CARBIDE CONTENT IN ORIGINAL BATCH

The authors have studied the features of forming structural and phase composition of composition coatings «steel R6M5 – (WC+TiC)» depending on tungsten monocarbide content. It was ascertained that retained austenite amount in composition coating depends on tungsten carbide content in the total volume of input strengthening phase. The coatings with 20 % of carbide constituent have austenite maximum (75 %) of the total matrix volume.

UDC 621.793.794.357.7

Durakov V.G., Gnyusov S.F., Dekhonova S.Z.
NICKEL EFFECT ON MICROSTRUCTURE AND PROPERTIES OF COPPER–CHROMIUM CONTACT MATERIAL OBTAINED BY ELECTRON BEAM FACING

The authors have studied the effect of alloying with nickel on microstructure Cu–Cr of the contact material obtained at vacuum electron beam facing and additional refining. Nickel input into original Cu–Cr-batch enhances the formation of homogenous copper chromium melt, decreases segregation and restrains chromium dendrites growth at crystallization.

UDC 621.791.92

Gnyusov S.F., Makov D.A.
THE STRUCTURE OF CARBIDE SUBSYSTEM OF COMPOSITION COATINGS ON THE BASIS OF AUSTENITIC STEELS

The authors have studied the effect of temperature cycling at multipass electron beam facing and further aging on features of vanadium carbide particles extraction in matrix on the basis of steel of nickel and manganiferous austenite. It was ascertained that vanadium carbide in composition coatings is represented in the form of separate equiaxed particles. Their average size equal 94 nm in manganiferous matrix and about 0,8 μm in nickel one.

UDC 669.295:539.62

Potekaev A.I., Khokhlov V.A., Galsanov S.V.,
Tabachenko A.N., Shulepin I.A.
PLASTIC WAVES IN TITANIUM NICKELIDE AT SPHERICAL INDENTER SLIDING

The authors have analyzed the conditions for generating frontal plastic waves and forming friction tracks at spherical indenter sliding over plastic half-space of titanium nickelide. The pulse step character of indenter movement and the changes of friction track type at various temperature-speed conditions were determined.

UDC 669.295:539.62

Khokhlov V.A., Potekaev A.I., Galsanov S.V.
THE INVESTIGATION OF TITANIUM NICKELID PROPERTIES INITIATED BY HIGH HYDROSTATIC PRESSURE

The article demonstrates the conditions for occurrence of pressure hydrostatic kernel at spherical indenter introduction into plastic media. The effect of hydrostatics on structural and phase states and strength properties of titanium nickelide was determined.

UDC 539.21:539.42.214

Soldatova M.I., Khodorenko V.N., Gyunter V.E.
PHYSICAL–MECHANICAL AND STRENGTH PROPERTIES OF ALLOYS ON THE BASIS OF TITANIUM NICKELIDE (TN–10, TN–20, TN–1V)

Physical-mechanical properties of alloys on the basis of titanium nickelide TN–10, TN–20, TN–1V were studied. It was ascertained that failure strain size and the failure stress value of each alloy are determined by matrix state for the alloy at fixed deformation point and by contribution of martensitic deformation mechanisms occurring at load. It was shown that the structure formed and the value of plastic constituent of alloy deformation affect considerably on fracture type and characteristics.

UDC 541.64:547.759.32

Sarychev K.Yu., Myasnikova V.I., Voloshina M.S.,
Konovalov S.V., Gromov V.E.
IMPLEMENTATION OF REHBINDER EFFECT IN ALUMINUM–GALLIUM SYSTEM ACCORDING TO BINARY SCHEME

The authors have developed the technique for implementing Rehbinder effect in aluminum–gallium system according to binary scheme. Aluminum brittle fracture has two stages: chemical interaction resulting in gallium occurrence on aluminum sample surface, classical liquid-metal brittleness development in aluminum–gallium system.

UDC 539.21;534.22

Belomestnykh V.N., Tesleva E.P.
ANOMALOUS THERMO–STRAIN BEHAVIOR OF CUBIC PHASE OF CYANIC CRYSTALS. I. SODIUM CYANIDE

The authors have studied temperature dependences of anisotropic and isotropic acoustic (elastic waves velocities), sizing (elastic modules) and dimensionless (Poisson's ratios) elastic characteristics of mono- and polycrystals of sodium cyanide in the range of 283,7...473,0 K.

UDC 681.5.01

Kasimova B.R., Baubek A.A., Kusataeva A.K.
THE DEVELOPMENT OF MATHEMATICAL MODEL OF ELECTRIC PRECIPITATOR WITH ROTATING COLLECTING ELECTRODE

The authors have developed the theoretical mathematical model of operation of electric precipitator with rotating collecting electrode.

The collecting electrode in the form of rotating strip was proposed to be applied to eliminate negative factors such as resistivity and re-entrainment affecting the electric precipitator operation; economic velocity for rotating strip was calculated.

UDC 621.892.1

Kovalsky B.I., Malysheva N.N., Tarasov E.V., Dyakov S.A.
THE RESULTS OF THE TEST OF SEMI–SYNTHETIC ENGINE OIL BIZOL DIZEL ULTRA 10W–40 CJ–4/SL

The article introduces the results of the test of all-season and all-purpose engine oil for thermal-oxidative stability and antiwear properties; the authors have proposed the criteria of antiwear properties and total energy absorbed by oil at thermal and tribotechnical tests.

UDC 621.892.28

Vereshchagin V.I., Kovalsky B.I., Runda M.M.
THE RESULTS OF INVESTIGATION OF MOTOR OIL STATE AT ENGINE OPERATING

The article introduces the data on the change of optical properties, viscosity, concentration of soluble and insoluble aging products and antiwear properties of synthetic motor oil Mobil 1 0W-40 SN/CF at engine operating.

UDC 544.733.422:519.87

Kudryashova O.B., Antonnikova A.A.
MATHEMATICAL MODEL OF AEROSOL EVOLUTION AT ULTRASONIC INFLUENCE

The mathematical model is based on Smoluchowski equation. The latter describes the dynamics of changing the size distribution function of aerosol particles considering ultrasonic influence, evaporation (for liquid-drop aerosols) and sedimentation. The authors have studied the asymptotic behavior of probability function of aerosol particle collision on ultrasonic frequency.

UDC 669:539.67

Kurilenko G.A.
EXPERIMENTAL DETERMINATION OF THERMAL SOURCE INTENSITY IN DAMAGE CENTER AT CYCLIC LOADS

It is shown that it is possible to determine the capacity of thermal source which seems to function in the center of developing the fatigue damage by thermal field of a sample at its step cyclic loading with the increasing peak stress. According to the kinetics of this capacity it turned out to be possible to predict in non-destructive way some characteristics of the fatigue process, the individual endurance limit of the tested object in particular.

UDC 621.45.042:532.592.2:544.772

Korovina N.V., Kudryashova O.B., Vorozhtsov B.I., Shrager E.R.
LIQUID ATOMIZATION AT PULSE INFLUENCE BY COMPRESSED AIR

The authors propose the physico-mathematical model of pulse atomizer operating on the compressed gas source. The cavitation role in atomization is shown. The article introduces a number of results of the model parametric study determining the dependences of aerosol dispersion, spray angle and mass liquid flow on dimensionless parameters characterizing the atomizer geometric properties. The physic-mathematical model allows selecting the atomizer characteristics for obtaining aerosol media with the prescribed parameters.

UDC 674.815−41

Plotnikov S.M., Lurye M.S.
MODELING THE TRANSLATIONAL–ROTATIONAL MOTION OF WOOD PARTICLES AT ORIENTATION

The article introduces the results of modeling the orientation of flat wood particles used for making plates of large size ship. The authors have obtained the dependences of fall time and particle turning rate on their parameters and height of fall which allow minimizing particle packing angle in chip mat.

UDC 66.021.1

Balyasnikov A.V., Zaripova L.F., Pishchulin V.P., Svarovsky A.Ya.
MODELING MIXING PROCESS BY THE JET METHOD OF LIQUID RADIOACTIVE WASTE IN RECTANGLE RESERVOIRS

The process of mixing liquid radioactive wastes (LRW) in rectangle reservoirs at vertical position of nozzles has been considered. The process modeling was carried out based on the similarity theory. The authors determined the constructive characteristics of mixing devices, solution velocity characteristics when flowing from mixing devices, the conditions of particles weighing in weak-salt LRW for defining the mixing time by the jet method.

UDC 621.039.576

Vorobyev A.V., Antonova A.M.
IMPROVEMENT OF EFFICIENCY OF THE DEVICE WITH WATER–GRAPHITE REACTOR AT PARTIAL LOADS

The authors have proposed and substantiated the method of operation of water-graphite reactor of RBMK type at controlled composition of blow-down gas. The article introduces the static and dynamic characteristics of temperature state for graphite moderator in the reactor RBMK-1000 determined experimentally. The authors developed the software code for engineering analysis of integral characteristics determining the reactivity margin value of the reactor RBMK-1000 in slow transitions.

UDC 534:621.32

Sosnin E.A., Panarin V.A., Pikulev A.A., Tarasenko V.F.
ACOUSTIC CHARACTERISTICS OF PLANAR KrCl–EXCILAMP OF DIELECTRIC BARRIER DISCHARGE

The authors have investigated experimentally and theoretically the acoustic characteristics of planar KrCl-exilamp of dielectric barrier discharge filled with a mix $Kr:Cl_2=400:1$ at pressure 20 kPa. The acoustic oscillation spectra of excilamp bulb were measured. Resonances were found out experimentally on frequencies of 4,96; 5,36; 9,92; 10,80 and 21,60 kHz. Frequencies of natural oscillations of excilamp bulb walls and acoustic waves in gas were determined by calculations. Energy of gas acoustic waves in dependence on oscillation frequency of bulb walls was defined. The comparison of the experimental results and the calculations shown that maximums of the acoustic signal in the frequency domain >10 kHz coincide with natural frequencies of gas oscillations in excilamp bulb.

UDC 622.243.1

Adam A.M.
RECTOR OF TPI A.A. VOROB'YEV IS THE INVENTOR OF ELECTROPULSE METHOD OF ROCKS DESTRUCTION

The article introduces the history of developing the electropulse method of rocks destruction by the rector of TPI A.A. Vorob'yov.