Abstracts and keywords by № 4(52) 2016

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| **1** | Identification of significant leads in the EEG during recognition imaginary movements  S.N. Agapov1, V.A. Bulanov1, N.G. Gubanov2, A.V. Zakharov3, M.S. Sergeeva3  1 IT Universe LLC  3, Eroshevskogo st., Samara, 443086, Russian Federation  2 Samara State Technical University  244, Molodogvardeiskaya st., Samara, 443100, Russian Federation  3 Samara State Medical University  18, Gagarina st., Samara, 443079, Russian Federation  Modern technology is actively use the brain-computer interface (BCI). Human interaction with the environment through a communication with the electrical and chemical activity of the brain is one of the most important components of the next stage of scientific and technological development in the XXI century. In recent years there has been significant progress in tasks of recognition and classification of various types of motor imagery. At the moment, one of the main methods of control in BCI are the EEG correlates of imaginary movements. The aim of this study is to identify the localization of most significant EEG electrodes in task of pattern recognition the motor imagery of the dominant arm. Using the fewer EEG electrodes should lead to increase the efficiency and reduce the cost of the EEG-equipment.  **Keywords:** EEG, motor imagery, Student's t-test, BCI.  C. 7-14 |
| **2** | COMPLEMENTARITY PRINCIPLE IN THE SCIENCE  OF MANAGEMENT PROCESSES IN SOCIETY  V.A. Vittikh  Institute for the Control of Complex Systems, Russian Academy of Sciences  61, Sadovaya str., Samara, 443020, Russian Federation  In the development of Bohr's complementarity principle, the paper formulates the complementarity principle with regard to the science of management processes in society, which postulates that, for the purpose of a complete description of a problem situation in society, it is necessary to use two mutually exclusive and, at the same time, complementary sciences, i.e. the classical science of management processes in society and the postnonclassical evergetics, which, together, provide a comprehensive description of the situation as the integrity.  Classic management science proceeds from the opposition of subject and object: a man is "removed" from the situation in public life, which he learns "objectively" from the outside, without any admixture of human subjectivity, acquiring abstract knowledge. Unlike classical science but in addition to it, evergetics assumes the superposition of subject and object, i.e. all heterogeneous actors being "inside" the problem situation, experience it, and produce a "living", according to S. Frank, knowledge.  **Keywords:** complementarity principle, science of management processes in society, evergetics, problem situation, abstract and living knowledge.  С. 15-21 |
| **3** | monitoring the state of natural and man-made objects with a closed automated system  ***Y.R. Vladov, M.Y. Nesterenko, V.V. Vlatsky***  Orenburg Scientific Centre of UrB RAS  11, Pionerskaya str., Orenburg, 460000, Russian Federation  Monitoring natural and industrial objects is one of the most actual scientific and practical problems. The article presents the developed methodology for monitoring of natural-technogenic objects with a closed automated system. A decomposition of the problem involves finding: optimal aggregation and analytical models of changes in the state, as well as models of the formation of the monitoring information. The GIS that includes a network of seismic stations is developed. The structural basis for a closed automated system monitoring software modules make finding relevant models of the state of natural and man-made objects, including models of formation of monitoring information. With its use of established significant (over 10%), improving the functioning and use of natural and man-made objects.  **Keywords:** condition monitoring, GIS technology, closed automated system, natural and man-made objects.  С. 22-31 |
| **4** | QUEUES MODELING IN BATCH QUEUING SYSTEMS (QMS)  B.Ya. Lichtcinder, L.B. Ivanova  Povolzhskiy State University of Telecommunications and Informatics  23, Lev Tolstoy st., Samara, 443010, Russian Federation  The paper describes queuing systems with batch request flows typical for modern multiservice telecommunication networks. It contains generalization of Pollaczek-Khinchin formula for systems with common type flows. The dependences of queues average value at low duty ratio are examined. Full absence of any queues because of a minimal time interval between nearby requests takes place. The term of conditional average queue size that is an average value with the absence of processor downtime intervals is given.  **Keywords:** conceptual model, resources, elements, links, corporative development.  С. 32-41 |
| **5** | OPTIMAL CONTROL OF INDUCTION HEATING PROCESSES WITH COMBINED REQUIREMENTS TO THE FINAL TEMPERATURE DISTRIBUTION OF THE OBJECT  ***E.Ya. Rapoport, A.V. Kapustina***  Samara State Technical University  244, Molodogvardeyskaya st., Samara, 443100, Russian Federation  This paper presents the problem of optimal control of induction heating process of the metal billet to the next operation of pressure treatment in conditions involving both if the billet immediately after heating is sent to deforming equipment, and if the need to move to temperature stabilization stage, depending on the implemented mode "pressure-heat treatment" technology complex. Proposed formulation and the method of solution of the corresponding the problem of time-optimal control with two at the same time the requirements presented demands to the final temperature of heated billets condition responsible for both options in advance unknown organization modes induction heating installation. The results and their analysis for the investigated models of induction heating process are given.  **Keywords:** optimal control, induction heating process, alternance method, temperature stabilization stage, requirements to the final temperature distribution of the object.  С. 42-51 |
| **6** | STUDY OF THE ERROR OF THE METHOD OF DETERMINATION OF PARAMETERS OF CAPACITOR SENSORS ON INSTANT VALUES OF TRANSIENT PROCESSES  V.S. Melent'ev, E.A. Susova, O.S. Sklez  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  In the control of parameters technological processes, which allow to do the continuous monitoring of the properties or conditions of various materials, grading products by the geometric dimensions, control of movement or position of the mechanisms, widespread capacitive sensors. Currently, high performance provide methods and systems of determining parameters of capacitive sensors for individual instantaneous values of the transition process in the measuring circuit when their connected to a DC voltage. The use of such methods provides a reduction in measurement time, which does not depend on the time constant of the measuring circuit, and is mainly determined by the duration of intervals used to implement the methods. One of the problems arising in the implementation of measurement tools using similar techniques, it is the effect of uninformative parameters of the measuring circuit and their instability on the result of the determination of informative parameters. Accounting uninformative elements of the equivalent circuit of the sensor allows to determine their influence on informative parameters. The aim of this work is to study the influence of resistance of connecting wires that connect the sensor to the measurement circuit, on capacity measurement error.  **Keywords:** the measuring circuit, transient, instant values, an error.  С. 52-58 |
| **7** | Using the diffraction analysis for rock carbonate contentS assessment  A.V. Pescov, V.A. Olkhovskaya, I.A. Stepanova  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  The results of the carbonated mineral contents quantitative assessment in multicomponent rock samples using the internal corundum standard method are presented. The radiographic quantitative phase analysis was conducted during the study and measurement errors of individual components contents caused by mode of radiographic equipment operation, the conditions of samples preparation, the influence of isomorphic impurities and peculiarities of diffraction patterns interpretation were determined. The influence of studied minerals textural variabilities on the uncertainty in the determination of corundum indexes has been noted. The analytical lines of the studied minerals and standard for improving the quantitative determinations accuracy was chosen on the experimental basis.  **Keywords**: radiographic phase analysis, mineral phase, internal standard method, corundum index, isomorphic impurity, diffraction pattern, integrated intensity, carbonate mineral contents.  С. 59-70 |
| **8** | INDUCTION HEATING BY PRODUCTION PLASTICS  L.S. Zimin, A.G. Sorokin  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  The analysis of modeling methods of electromagnetic and thermal fields is carried out. By means of the finite-element method realized programmatically the electro thermal model of system of induction heating for plastic production is simulated by method of casting. Electromagnetic and thermal fields are studied. Results of calculation are given in numerical model. The provided mathematical model of system of induction heating can be used when designing technological complexes of plastic production. The original system of induction heating for plastic production is offered by a casting method. The main energy indicators and algorithms of work which provide required temperature distribution in the heated polymeric material are determined.  **Keywords:** plastic production, molding machine, electrothermal model, modeling methods, energy parameters.  С. 71-76 |
| **9** | POWER SELECTION OF COMPENSATING DEVICES TO OPTIMIZE THE LEVEL OF LOSSES IN THE ELECTRIC NETWORK  ***Y.P. Kubarkov, K.A. Golubeva, Y.V. Makarov***  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  One of the main tasks in electrical networks is the task of mode optimization and power loss reduction. For these purpose static capacitor batteries are used the power of which must be determined in each particular case.  *This* *paper discusses optimization of the operating mode of the radial design of the electrical network. The calculation method of the nonlinear programming produces power compensation devices, which are installed in the locations of load. The analysis of active and reactive power losses for transmission lines (PTL) and transformers is made.*  **Keywords:** optimization, power loss, capacitor banks, non-linear programming method.  С. 77-82 |
| **10** | Improvement of methods for the elimination  of unacceptable current overload of network  elements in large power systems.  V.V. Petrov1, V.I. Polishhuk1, A.A. Almendeev2  1 Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  2 Bramch of «SO UPS» – «Samara RDO»  5, Polevaja str., Samara, 443100, Russian Federation  In the process of control power system there are frequent situation associated with inadmissible overload of electrical network elements resulted in the equipment failure and cascade development of emergency process in the power system. This overload is eliminated by the operational personnel of electrical networks in a variety of ways including load shedding. In this paper the technique of overloading elimination of electrical network elements using the regulating load effect of eliminating or reducing the volume energy consumption constraint is proposed. In the PC Mathcad for simulated power system the calculations on the proposed method are given resulted in download system reduction of communication.  **Keywords:** power system, static characteristics of the load nodes, voltage, optimization.  С. 83-90 |
| **11** | METHODS FOR APPROXIMATING JOIN POINTS TWO SINUSOIDAL FUNCTION DAY AND NIGHT CYCLE ENERGY CONSUMPTION FOR SOLVING THE PROBLEM SHORT-TERM FORECASTING  OF POWER CONSUMPTION FOR THE DAY AHEAD  R.N. Khamitov1, A.S. Gritsay1, I.V. Chervenchuk1, G.E. Sinitsin2  1 Omsk State Technical University  11, pr. Mira, Omsk, 644050, Russian Federation  2 Omsk Energy Retail Company, LLC  41/15, pr. К. Marksa, Omsk, 644123, Russian Federation  Relevance of the work due to the demand of the wholesale electricity and capacity market participants on ways to build short-term forecasts of electricity consumption in order to improve the quality and accuracy of the predictive model. The method of approximation of electricity daily schedule using sinusoidal function of approximation separately for day and night cycles of electricity. The possibility of applying one of the known approximation techniques for smoothing the points of join two sine functions describing the cycles of day and night electricity. The proposed method is applicable to entities with a view to approximating historical data on power consumption, the selection of the coefficients of the approximating function – period and amplitude for the possibility of its extension to the interval up to 24 hours. Currently, there are many methods to build short-term forecasts based on statistical and factual, expert and multi-factor models, however, they are not always acceptable, since most of the consumers is not transmitting hourly data of power consumption, at the same time, energy sales company operates the system operator data (JSC System operator of the Unified energy system), which have a limited set of parameters. This method can be applied not only to energy sales company, but also an industrial enterprise, where day and night electricity cycles have distinct differences. In this case, it is necessary to choose the coefficients of the approximating function – the amplitude and frequency of the proposed method. To construct a computational model used analytical Rapidminer system. These results were obtained using historical data electricity LLC "Omsk Energy Retail Company", where a significant proportion – 75 % of the total electricity consumption business and 25 % individual customers.  **Keywords:** data analysis, approximation, short-term forecasting of power consumption.  С. 91-98 |
| **12** | RESEARCH OF COMPLEX HEAT TRANSFER IN MULTILAYER  CYLINDRICAL STRUCTURES SOURCES  L.S. Abisheva  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  Experimental and theoretical investigations of complex heat exchange in gas seam are given which allowed to analyze heat transfer process, to define the quality of each heat exchange constituent (heat convection and emission), to find equivalent heat conduction coefficient of vertical cylindrical air seam at different modes of operation of laboratory unit at wide temperature range (from 0 till 3000 0C. The results will be useful for heat exchange processes in gas seams and for the choice of the most optimal seam thickness, walls material and agent composition, etc.  **Keywords:** heat transfer, energy saving gas layer, the radiation, the system of nonlinear equations, convective heat transfer equivalent coefficient of thermal conductivity of the gas layer, the graph-analytical method.  С. 99-107 |
| **13** | OBTAINING EXACT ANALYTICAL DECISIONS OF TASKS HEAT CONDUCTIONS WITH VARIABLES IN TIME BOUNDARY CONDITIONS  I.V. Kudinov  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  On the basis use of additional required function and additional boundary conditions in an integral method of heat balance, the exact analytical decision of the nonstationary task of heat conduction for the infinite plate with a variable boundary condition of the first kind in time is received. Use of time-dependent additional required function is based on the heat conduction of the infinite speed of distribution of warmth described by the parabolic equation according to which temperature in any point of a plate begins to change right after the application of a boundary condition of the first kind on its surface. The additional boundary conditions used when obtaining the solution are found in such look that their execution by the required decision was equivalent to execution of a differential equation of boundary value problem in boundary points. It is shown that execution of the equation in boundary points, leads to its execution and in the considered area. Execution of integral of a heat balance, that is input differential equation, average within thickness of a plate, allows to consolidate the solution of a partial equation to integration of an ordinary differential equation of rather additional required function. Absence of need of integration of the input differential equation on space variable, being restricted only to execution of integral of a heat balance, allows to apply this method to the tasks including difficult differential equations (non-linear, with variable physical properties, etc.) which obtaining exact decisions by means of classical analytical methods isn't possible.  **Keywords:** nonstationary heat conduction, the infinite plate, variables in time boundary conditions, the exact analytical solution, the infinite speed of distribution of warmth, an integral method of a heat balance, additional boundary conditions, additional required function.  С. 108-117 |
| **14** | THE FIELD TESTS OF PIPE STEELS IN SOLUTION WITH HIGH  CONTENT OF H2S AND CO2  T.A. Borisenkova  Samara State Technical University  244, Molodogvardeyskaya st., Samara, 443100, Russian Federation  The [object](http://www.multitran.ru/c/m.exe?t=23044_1_2&s1=%F6%E5%EB%FC) of this research is to compare the results of new laboratory corrosion tests and field tests under real conditions. The field tests were carried out on the Ozeksuat’s field of LLC "RN-Stavropolneftegaz". The content of H2S and CO2 in this field is higher another fields of LLC "RN-Stavropolneftegaz". Comparative analysis showed a correlation of laboratory and field tests. It means the chosen laboratory parameters was correct. The comparison was carried out on low-alloyed steels. There were research the visual, morphological and chemical characteristics.  **Keywords:** CO2 + H2S, oil and gas pipes, corrosion products, field tests, laboratory tests.  С. 118-122 |
| **15** | STUDY OF WELDED JOINTS OF HIGH-TEMPERATURE ALLOYS CR15NI45MO5W1TI2AL1NB3P MADE BY ELECTRON-BEAM  WELDING  S.L. Isaev  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  Optimal parameters of electron beam welding (EBW) of heat-resistant alloy of the Cr15Ni45Mo5W1Ti2Al1Nb3Pbrand with thickness of 4.5 mm made without lining technology were defined. The effect of the EBW mode on the formation of defects was studied.Propensity of Cr15Ni45Mo5W1Ti2Al1Nb3P alloy to the defects formation was investigated on the sample-simulatordivided into seven equal portions at welding speeds of 7mm/s and 11 mm/s. To evaluate the quality of welding, each of the samples was subjected to X-ray inspection, cutting and metallographic investigation with the definition of the parameters of welds, micro hardness and the defects presence. The obtained values of the welding parameters for a butt joint provide the required quality and the size of the weld.  **Keywords:** electron-beam welding, heat-resistant alloy, welding speed, microhardness, optimal welding conditions.  С. 123-129 |
| **16** | STUDY THE POSSIBILITY OF OBTAINING MICRO-  AND NANOPOWDER NITRIDE COMPOSITION Si3N4-TiN IN SILICON HALIDE – SODIUM AZIDE – TITANIUM HALIDE SYSTEM  BY SHS AZIDE TECHNOLOGY  L.A. Kondratieva, I.A. Kerson, G.V. Bichurov, A.P. Amosov  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  The possibility of obtaining a nitride of the composition Si3N4–TiN of asigny systems Na2SiF6–NaN3–Na2TiF6, (NH4)2SiF6–NaN3–(NH4)2TiF6, Nа2SiF6–NaN3–(NH4)2TiF6, (NН4)2SiF6–NaN3–Na2TiF6 with different ratio of components in the starting material by technology of self-propagating high-temperature synthesis. It is established that the final product obtained is a fine (submicrocrystalline) powder of spherical and equiaxed shape with average particle size of 150–250 nm. The final product consists not only of Si3N4, TiN and Ti2N, but it includes by-products: silicon, titanium, titanium silicide TiSi2 and halide salt – hexaferrite sodium Na2TiF6. The presence of side products is due to the fact that the combustion temperature of the systems studied are not sufficient to undergo the necessary chemical reactions nitriding and obtain the nitride of the composition Si3N4–TiN without impurities.  **Keywords:** silicon nitride, titanium nitride, nitride composition, sodium azide, halide, self-propagating high-temperature synthesis, fine (submicrocrystalline) powder.  С. 130-138 |
| **17** | **BENCH TEST TOOL JOINTS DRILL PIPE AFTER RE-SURFACING**  D.A. Miheev  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  The paper is devoted to the results of the application of repair technology of drill pipes bysurfacing. The analysis of the requirements for the tool joints after a recovery is made. Modeling of the stress state by finite elements is produced, bench testing is analytically explained. It is established that the destruction of the test samples on recovery did not occur, which confirms the feasibility of the previously proposed technology. Obtained bench tests data were used to develop the guidance manual for steel drill pipes with welded locks after repair in terms of restoration tool joints by surfacing method.  **Keywords:** tool joint, drill pipe, bench tests, axial load, fatigue.  С. 139-146 |
| **18** | RHEOLOGY AND FLOW RESEARCH OF CLAYS OF RUSSIAN  DEPOSITS FOR CERAMICS PRODUCTION  M.G. Moshnyakov, T.A. Orlova  1Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  2OOO «Samara Stroyfarfor»  Volga region, Stroykeramika village, Samara Region, 443528, Russian Federation  The paper provides the overview of domestic clays considered as raw materials for production of porcelain stoneware. Some features of dissolving clay and problems of clay dilution using common electrolytes are described. Examples of the most common viscometers with concise methods of measurement of fluidity (viscosity) are given.The experimental part provides graphs of dependence of clay dilution on concentrations of electrolytes for claysof Latnenskiy and Druzhkovskiy deposits. The conclusion of high rheological properties of clay of Latnenskiy field was made .The results of the experiment allowed to determine the amount of added electrolyte in the various clay to obtain the desired viscosity are described. The conclusions about the possibility of using domestic clays as raw material for the production of porcelain stoneware is done.  **Keywords**: clay, porcelain, viscosity, flow, dilution, viscometer, electrolytes.  С. 147-157 |
| **19** | ANALYSIS OF THE POSSIBLE CAUSES OF FAILURE OF GOOD SMOOTH DRILL PIPE  A.A. Suslinа, K.I. Koshcheev, T.M. Pugacheva  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  The analysis of reasons for emergency destruction of light alloy drill pipes is given. During the examination the studied macro - and microstructure of damaged structural areas of the metal drill pipe and the chemical composition of the metal, characteristics of strength, ductility and hardness are defined. The conclusions on drill pipe quality were made. The main reasons of quick drill pipe wear during operation were named.  **Key words**:aluminum drilling pipe, chemical composition, mechanical properties, microstructure, metallurgical quality, causes of wear.  С. 158-162 |
| **20** | OBTAINING OF Al-AlN NANOCOMPOSITE BASED ON SHS-AZ  ALUMINUM NITRIDE NANOPOWDER  A.V. Sholomova, Y.V. Titova, D.A. Maydan, A.V. Bolotskaya  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  Method of azide self-propagating high-temperature synthesis (SHS-Az), using sodium azide as a nitriding reagent, was used for obtaining the nanopowder of aluminum nitride from precursor – sodium hexafluoroaluminate. The product of burning the mixture of Na3AlF6 + 3NaN3 after water rinsing consisted of micro - and nanoparticles of AlN (65%), as well as any salt Na3AlF6 (35%). This product of SHS-Az was mixed with copper powder and pressed into a briquette of nanopowder master alloy Cu-4%(AlN+35%Nа3АlF6), which was successfully introduced into aluminium melt at a temperature 850оС. The salt Nа3АlF6 in the product of combustion played a role of flux during introducing into the aluminum melt and was not included in the final composition of the composite alloy. The microstructure of the obtained cast composite aluminum alloy with the calculated composition of Al-1.2%Cu-0.035%AlN showed that the reinforcing particles of AlN of different sizes, including nanoparticles, are distributed mainly along the grain boundaries of the aluminum alloy.  **Keywords:** self-propagating high-temperature synthesis, sodium azide, aluminum nitride, nanopowder, master alloy, composite.  С. 163-169 |
| **21** | USING PROBABILITY CELLULAR AUTOMATA FOR PLATING  PROCESS MODELING  S.B. Konygin1, A.N. Agafonov2, A.S. Afanasyeva2  1 Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  2 Samara University  34, Moskovskoye sh., Samara, 443086, Russian Federation  This paper desribes a plating process modeling using probability cellular automatic device. The modeling plating process ran on non-metal substrate with a previously created metal film. In this research one-dimensional cellular automatic device was used. The processes of dissolution, plating and diffusion were taken into consideration. Probabilities of elementary processes were calculated with the influence of electrical field. The relationships between time and number of plated ions for different voltages were obtained. When thickness of the film is less than minimal value the plating process of electrical settling does not take place.  **Keywords:** probability cellular automata, plating, modeling .  С. 170-173 |
| **22** | ANALYSIS OF PITTING FORMATION IN PIPELINE  N.G. Katz, D.V. Konovalenko  Samara State Technical University  244, Molodogvardeyskaya str., Samara, 443100, Russian Federation  This paper presents pitting corrosion formation on the inner surface of pipeline. This pipeline serves for aggressive high-mineralized liquid transportation. A visual research in field and laboratory conditions was used. A perforating pitting on the presented photos of pipeline was shown. The analysis of corrosion centers and possible reasons of their formation were shown. A conclusion of possible protection methods was made.  **Keywords:** potentiostat, sacrificial protection, steel and magnesium bottom tread polarization curves.  С. 174-177 |