METHOD OF MANAGEMENT OF INFORMATION ENVIRONMENT OF DEVELOPMENT PROJECT

page 4–7

The method for the management of information environment of development project, which includes three major procedures: forming the input data to manage the information environment of development project, limiting the methods for managing the information environment of development project, estimating costs and benefits of implementing the methods of the management of information environment of development project. The expert method was proposed to use as the basis of developing the input data to manage the information environment of development project. Furthermore, the experts form matrixes of priorities of the methods for the information environment management (benefits) and matrixes of costs for implementation of these methods (costs). The resolution principle (knowledge-based inference) was proposed to apply in order to limit the methods of information environment management. For selecting the best method of information environment management it was proposed to perform the modeling of the order of filling this environment with the method that maximizes the target formula.

Keywords: development, projects management, information environment management.

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RESEARCH OF PROCESSES OF INTERACTION IN THE SYSTEM FILLER — EPOXY-ACRYLIC FILM FORMING AGENT

page 7–9

The paper considers the influence of surface properties of disperse fillers and the nature of film-forming agent on physicochemical interaction in the system of composite material. Such surface properties of fillers as specific area and polarity were considered. The surfaces of calcium carbonates were used as high-polar surfaces, and kaolines surface — as medium polar. The first have low specific surface area in comparison to the second. It is shown that the value of polymer absorption from dispersion depends on the grade of surface development in greater extent than on its polarity. Also, it was mentioned that more polar epoxy resin shows greater degree of interaction with both types of surfaces. This fact is evident from the results of determination of sorption properties of compositions with respect to water vapor, as well as due to IR spectroscopy. The results of the study can be used in paint coating technology to obtain compositions with increased level of interaction between polymer and filler thus providing increased strength and atmospheric resistance to the protective coatings.

Keywords: filler, phase interaction, acrylic polymer, epoxy resin, adsorption, moisture sorption, coating.

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PROGRAM IMPLEMENTATION OF K-MEANS METHOD OF INTELLIGENT INFORMATION-CONTROL SYSTEM OF COMPOUND FEED PRODUCTION

page 9–11

The issue of classifying data when managing technological processes and compound feed production was substantiated. The program complex performs functions of integrated optimization and analysis of compound feed and premix rations. The programs involve new pattern of ration which first takes into account losses caused by unbalanced feeding (reduction of productivity, reproduction, health and breeding abilities). The programs allow comprehensive optimization of rations, determination of necessary feed additives and formulation of recipes of compound feeds, premixes, PVMA (protein-vitamin-mineral additives), which are very well combined with basic feed and considered when planning the feed expenditure. The issue of optimization

of feed production plan is important for all agricultural enterprises with livestock industries, but it is extremely topical for livestock-based industries producing feeds, since it allows finding additional feed production reserves by means of improving the structure of sown areas and feed expenditure. Before creating livestock complexes, it is necessary to identify the sources and amounts of feed supply. Substantiation of the feed base and computing of the plan variants should be implemented using methods of mathematical modeling and ECM. The analysis of data classification was made and the choice of the k-means method for feed components classification was substantiated. The software for the k-means algorithm implementation was developed and various algorithm patterns, depending on initial conditions, were worked out.

Keywords: compound feed, technological process, management, method, algorithm, intelligent control, clustering, analysis.

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DEFINITION OF RATIONAL METHOD OF EXTRACTION OF STONE MONOLITHS FOR CAPITAL TRENCHES

page 12–16

The problems and issues that arise during the mechanical method of separating the monolith from the array are considered. For example, at what angle to drill or cut the vertical plane of the monolith, which take the optimal size of the monolith, what mechanisms or tool to use in the separation of the monolith from the array. In all cases, the need to move the monolith or upset, it is this specific problem discussed in our publication. The length of the monolith takes 2 m in all cases, the volume of the monolith with decreasing trench increased. The publication efforts that are necessary for monolith tipping or moving away from the monolithic array, depending on the angle of drilling or cutting the monolith back are calculated. The optimal drill angling the monolith back to the maximum slope of the capital trench is defined.

Keywords: stone, angle drilling, overturning force.

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INFLUENCE OF AUTOMOBILIZATION LEVEL ON TRAFFIC FLOW PARAMETERS

page 16–19

The issues of the influence of automobilization level on traffic flow parameters are considered in the paper. The topic of the paper is relevant as a result of aggravated traffic problems in large cities in the world and Ukraine in particular. Problems are caused by the lack of correspondence between amount of transport vehicles and traffic capacity of transport network elements. The influence of the automobilization level on traffic characteristics was analyzed by many researchers. A somewhat different approach to estimating the automobilization level and assessing its influence on parameters of traffic flows was proposed in the paper. The level of automobilization was suggested to estimate depending on the purchasing power of population and its number in city districts. The level of automobilization and traffic volume in the network are connected by growth coefficients. The growth of the automobilization level leads to the increase of growth coefficients and the number of correspondences in the city transport network respectively. The modeling of transport network load allows the analysis of traffic flow parameters and their correlation with the automobilization level. The correlation of the automobilization level and traffic flow parameters is set for every type of streets and roads separately. The analyzed parameters include traffic load coefficient, traffic capacity reserves, transport operations. Knowing the mechanism of the automobilization level influence on traffic flow parameters allows planning measures for improving city transport networks and reducing negative effects of automobilization in social, economical and environmental aspects.

Keywords: automobilization level, traffic flow, transport network, load coefficient.

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CONVECTIVE HEAT TRANSFER ON EXTERNAL SURFACE OF PLAIN TUBE

page 19–23

The paper gives the analysis of calculation methods and results of calculating the intensity of heat transfer from the surface of round single tube, tube bundles in conditions of forced, free and mixed convection. The analysis shows the differences in results depending on the method of calculation. From a practical point of view these methods are used for calculating the heat transfer intensity for various types of heat exchange equipment. The most difficult situation is observed in the field of small Reynolds numbers. For certain types of layout (e.g. tube bundles) strict methods for calculating the heat transfer intensity in free and mixed convection are absent.

The obtained results indicate the need for more complete study of heat transfer phenomena in mixed and free convection, especially in bundles of horizontal tubes.

Keywords: free convection, forced convection, tube bundles, single tube, heat transfer.

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APPLICATION OF GEOPHISICAL METHOD FOR CADASTRE REGISTRATION OF RECREATIONAL TERRITORIES

page 24–28

Despite the presence of normative fixed procedure, regulating the information exchange between town-planning and state land cadastres, there is the problem of interaction between these two systems. One of the problems is associated with insufficient informativeness of the land cadastre system. The land cadastre system lacks the data on territorial zoning by the state of engineering-geological environment that complicates making decisions on rational use of land resources of territories. The state of engineering-geological environment can be assessed by various methods. One of the most appropriate methods in terms of its informativeness, easiness in conducting researches and reliability of information obtained is the method of the Earth's natural pulsed electromagnetic field (ENPEMF). The paper gives the example of using the ENPEMF method for assessing the effect of engineering-geological factors on the plot of territory. Proposals on classification and registration of territorial zones of engineering-geological factors action in the land cadastre system were given.

Keywords: territorial zones, engineering-geological factors, land cadastre, town-planning cadastre, geophysical methods.

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PSEUDO-RANDOM NUMBER GENERATORS BASED ON DISCRETE LOGARITHM

page 28–31

The mathematical model of pseudo-random number generator is given in the paper. The problems of discrete logarithm tasks solving and the concept of «hard bits» for discrete logarithm are considered in the paper. Constraints are imposed related to the absence of logarithm which can compute the discrete logarithm of $y = g^x \bmod p$, where $x \le 2^c$ for polynomial time. The constraint is called the assumption on discrete logarithm with short c bit exponents ($c - DLSE$). As an example, the Sundaram-Patel's generator is given, qualitative and quantitative characteristics of the generator resistance to the main types of attacks are proposed.

The paper gives the analysis of algorithms for generating pseudo-random numbers, such as the algorithm of Blum-Blum-Shub algorithm, Blum-Micali, Fortuna and Yarrow. Based on specified criteria, evaluation of algorithms is given, conclusions on the advantages and disadvantages of each algorithm are made.

Keywords: generator, discrete logarithm, pseudo-random number, cryptographic strength, algorithm, bit.

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DESIGN OF MATHEMATICAL MODEL FOR RELIABILITY ASSESSMENT INFORMATION PROCESSING SYSTEM

page 32–36

The research work is intended to solve the issues in mathematical model management for reliability assessment and efficiency of complicated data processing system (DPS) which is used in oil and gas industry. For reaching this purpose the article deals with the issue of determing probability of trouble-free operation of complicated data processing system. The listed elements of DPS have different functional assignments and are joined in such a way that reliability of each of them has direct impact generally on working capability of the whole system. The offered approach allows essentially to reduce calculation intensity of complex events probability. As technical and mathematical software for modeling and solving the issue it would be enough to have a modern personal computer with the standard (general) mathematical software.

Keywords: software, monitoring, probability values, data processing system.

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THE MODEL OF PARTICLE MOTION IN A MAGNETIC HYDROCYCLONE

page 36–41

The model of curvilinear motion of particles in a hydrocyclone with a radial magnetic field is proposed. As the forces acting on the particle the following were considered: centrifugal force; the force of medium resistance, including taking into account the change in the coefficient of drag at the walls of hydrocyclone; magnetic force; gravitational force; buoyant force; lift force acting on a rotating particle (the Magnus effect); lift force generated by shifting the field of fluid flow (the Saffman's lift force); the force generated by additional (virtual) weight; traction force generated by the pressure gradient of viscous medium; Basset force, which arises due to the lag of the boundary layer of fluid during the change of relative velocity of the particle. The analysis of forces is given that contains numerical formulas for calculating them and illustrations; forces which have the most significant effect in the particle dynamics are highlighted. The model is based on the Lagrange approach and implemented in a cylindrical coordinate system. The numerical solution of differential equations systems is given, performed with the use of the MathCAD program.

Keywords: model, magnetic hydrocyclone, Lagrange approach, magnetic field.

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MECHANICAL PROPERTIES OF WHISKERS

page 42–44

It is known that the structure of thread-like crystals is perfect and the limit of their strength approaches to the theoretical. However, the studies showed the ambiguity of relationship between the structure of perfect «whiskers» and their high strength. Literature review, conducted in the paper, concerning the research of such group of properties of thread-like crystals as mechanical properties, showed the presence of defects in the crystal structure of «whiskers» and the dependence of the strength of crystals on transverse and longitudinal sizes of «whiskers».

The study of mechanical properties of thread-like crystals is considered in many of literature sources, in particular 12 sources were mentioned in the paper, but evaluations of the results of experimental studies are quite different and ambiguous. Based on the literature review, corresponding conclusions on some mechanical properties of thread-like crystals were considered, estimated and outlined in the paper, the influence of the changes of their characteristics on the structure of crystals and ambiguity of estimation of direct relationship between the strength of crystal and its structure was analyzed.

Keywords: whiskers, mechanical properties, structure, strength, relationship.

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KINEMATIC MODELS OF «GROUND ANTENNA — SPACE VEHICLE» MECHANICAL SYSTEM

page 45–51

The method of analysis of possible motion variants of space vehicles of the satellite system within the view of its ground stations is suggested. It is meant to be used at the stage of satellite systems design. The method is based on two simplified kinematic models of mechanical system «ground antenna — space vehicle» (the models, describing the kinematics of the line connecting the location point of an integrated station of the satellite system with the center of space vehicle masses as it moves above the local horizon of the ground station).

In the models, the kinematic parameters of mechanical system (angles, directing the ground antenna to the space vehicle and the distance between the ground station and the space vehicle) are expressed not as a temporal function, but as a function of an introduced universal parameter. The first model does not take into account the Earth's rotation that allows using merely analytical correlations. The second (specified) model takes account of the Earth's rotation, and the rotation time is expressed as the function of the introduced universal parameter.

The use of the proposed method allows prompt analysis of parameters of connection between ground antennas and space vehicles, estimating not only maximum and minimal values, but getting average values as well by conducting qualitative analysis on the set of possible visibility intervals of space vehicles of the satellite system.

Keywords: satellite system, space vehicle, kinematics of ground antenna, satellite connection.

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TO THE QUESTION OF DEFINITION OF A DEFLECTION AND PRESSING OF NON-RIGID PROPELLER SHAFT

page 51–55

The paper considers the impact of weight and cutting forces on deflection and pressing of the non-rigid part — propeller shaft. The analysis of literature sources in the field of kinematics and dynamics of the process of turning by the cup tools was conducted. The purpose of the work was stated as a result of the analysis.

The purpose of this paper is to derive a mathematical expression of the dependence of deflection and pressing values of the non-rigid shaft on its own weight and cutting forces.

The propeller shaft of the mine pump was selected as the object of research. The design of the propeller shaft is characterized as non-rigid. Therefore, it was the object of further researches.

To derive the mathematical expression of shaft deflection under its own weight, the weight was considered as a uniformly distributed load.

Differential equation of Euler-Bernoulli was used in order to solve this problem. In the process of turning, round tool under the influence of feed moves along the workpiece and presses on it in every particular point. The Vereshchagin's method was used to derive the mathematical expression of shaft deflection from the cutting force.

The results obtained in this work can be applied to the process of turning of all non-rigid shafts by the round cup tool.

The mathematical expressions of deflection of the propeller shaft under its own weight and its pressing by the cutting forces allow optimizing the process of turning and improving the accuracy and quality of processing.

Keywords: non-rigid shaft, cup tool, deflection, pressing.

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DETERMINATION OF THE INFLUENCE OF DRIVERS' PERSONAL BIORHYTHMS ON THE PROBABILITY OF ROAD TRAFFIC ACCIDENTS

page 55–57

The researchers indicate that the level of traffic safety is influenced by many psychophysical qualities of drivers, allowing the prevention of road traffic accidents — attention, fast reaction, even temper, emotionality, resilience to risks. The emotional state is very important for human activities, in most cases determining the correctness and accuracy of actions. The paper gives the results of studies of the influence of parameters of physical, emotional and intellectual biorhythms of drivers on the probability of road traffic accidents. The change in the probability of road traffic accidents is accurately described by the regression equations, in which the parameters of driver's physical, emotional and intellectual biorhythms are used as variables. The studies have shown that physical biorhythm has the greatest impact on the probability of traffic accidents and allows the most accurate determination of the probability value. Thus, the estimation of developed models, based on statistical parameters, indicates that they can be used in practical calculations to predict the probability of road traffic accidents.

Keywords: road traffic accident, personal biorhythms, driver.

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TECHNOLOGICAL AUDIT OF MODIFYING CAST IRON FOR CASTING AUTOMBILE AND ROAD MACHINERY

page 58–63

Quality control of machine-building parts implies considering the issues related to obtaining high-quality alloy. The right choice of alloy modification process, depending on the type of modifier and the way of its application, is foreground. The difficulty in adequate selection of these parameters is a problem for efficient task solution. The experience of experimental and industrial examinations was described in the paper that allowed formulating a number of significant conclusions, concerning a reasonable choice of a modifier, based on compromise criteria, concerning the necessity of increasing modification process quality on the one hand, and reducing expenses of a company, related to purchasing or irrational application of expensive modifiers on the other hand. It was shown, that the choice should be based on conducting metallographic analysis of the microstructure of cast iron, treated with the compared types of modifiers in the core zone and periphery of a wedge sample and their «linking» with minimal thickness of casting section, produced under certain industrial conditions. The result of such analysis for each parameter of the microstructure and each of compared modifiers is the construction of histograms, describing the distribution of a qualitative feature of the estimated parameter, and their further comparison. The obtained difference of mathematical expectations of estimated microstructure parameters for the compared modifiers is the qualitative estimation of efficiency of the compared modifiers. The method can be recommended to industrial enterprises, producing shaped castings for machine-building parts.

Keywords: microstructure, modifier, grey iron, estimation of structures, application efficiency.

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