

**Automation and management of technological processes and productions**

**Solovyev I.G., Vedernikova U.A., Govorkov D.A., Ryazantsev A.E.**

**BAROMETRIC MODEL OF CONTROL TECHNOLOGY OF GAS-CONDENSATE FIELD PRODUCTION**

*Considered rules to evaluate the hydraulic model «bore-hole zone — lift — choke — line — gas gathering network» of gas-condensate field with gas phase of flow being dominant. The examples of perturbed operation modes computational analysis are given.*

**Pressure, volume flow, pressure drop, hydraulic resistance.**

**Mathematical modeling, numerical methods and complexes of programs**

**Burago N.G., Nikitin I.S., Tsibulskii V.R., Yakushev V.L.**

**NUMERICAL SIMULATION OF THE SINTERING OF POWDER MATERIALS UNDER ACTION OF MOVING LASER PULSE**

*The new numerical algorithm is developed for solving of the problem of «hot» sintering under action of moving high-energy (laser) pulses. This algorithm is based on the new theoretical model of the sintering of two-component powder materials. The kinetics of porosity, the evolution of thermomechanical properties and shape changes are taken into account. The influence of the input thermo-mechanical parameters in the process of sintering for the technology of additive manufacturing is investigated.*

**Sintering of powder materials, manufacturing, moving laser pul, porosity, melting temperature, nonlinear system, finite-difference scheme.**

**Bichin I.V., Gorelikov A.V., Ryakhovsky A.V.**

**MODELLING OF NATURAL CONVECTION IN A SPHERICAL SHELL WITH ROTATING BOUNDARIES**

*Algorithm for numerical simulation of natural convection in spherical shells with rotating boundaries is described. The algorithm is based on the conservation of angular momentum. The results of numerical experiments on natural convection in thin spherical shells are presented.*

**Numerical simulation, natural convection, spherical shell.**

**Galkin V.A., Epifanov A.A.**

**NUMERICAL MODELING OF A FLAT FLOW OF INCOMPRESSIBLE LIQUID**

*Use of modern PC allows modeling of uncompressed liquid complex flow with systems of partial differential equations. Building an effective algorithm for unsteady Navier – Stokes equations is still actual task. The purpose of this work is numerical modeling of uncompressed liquid flat flow in an area with circle or rectangle form. Numerical computing was done for several values of Reynolds number and for integration Rung-Kutta second order scheme was used.*

**Numerical modeling, uncompressed liquid flat flow**

**Huseynova R.O.**

**THE METHOD OF LINEAR — FUZZY PROGRAMMING FOR SOLUTION OF OPTIMIZATION TASKS ON PREDICTION OF APPEARANCE OF GROUND OZONE**

*It is shown, that the task of providing of conditions for minimum increase of ozone's concentration during two sequential days featured with different meteorological and ecological characteristics can be formulated as an optimization task on minimization of difference of generated volumes of ozone during the time interval  $\Delta T_1$  of the first day and  $\Delta T_2$  of the second day, which are most auspicious for generation of ozone. It is proved theoretically, that the formulated ecological task can be solved using the*

method of linear programming. It is shown, that some limitation conditions used in solution of the optimization task can be formulated using the theory of fuzzy sets.

**Linear programming, ground ozone, optimization, concentration, prediction, fuzzy relation.**

## **Management in social and economic systems**

**Simonov S.G., Durtseva A.G.**

### **ALGORITHM FOR ESTIMATING THE ECONOMIC SECURITY OF SUBJECTS OF SMALL AND MEDIUM BUSINESS**

*The article shows the role and place of medium and small farms in the domestic business system, proposed algorithm for estimating the socio-economic security. The main basic criteria and indicators of socio-economic security of entrepreneurship «second tier» and the method of constructing the matrix damage medium and small business organizations.*

**Economic security, medium business, small business, threat, damage, risk.**

**Bystray G.P., Lykov I.A.**

### **SYNERGETIC DYNAMICS OF GRP GROWTH CONSIDERING ACCUMULATION AND CONSUMPTION**

*Paper is devoted to the construction of dynamical model of GRP with the consideration of accumulation and consumption in the presence of sources and sinks. This study used the first principle — there are limitations of regional resources in the economic system, as well as limitations of primary factors — accumulation and consumption, and there is also a possibility to direct previously accumulated part on consumption; the second is anthropogenic — the periods of development characterized by the human desires to maximize consumption. As part of the problems with peaking synergetic model of market disequilibrium for GRP was developed as a system of two nonlinear differential equations describing the selforganization of the market structures.*

**Regional economics, synergetics, the problem with peaking, consumption, accumulation, regional processes.**

**Chichkanov V.P., Bystray G.P., Nikulina N.L., Lykov I.A.**

### **NONLINEAR ANALYSIS OF CRISIS STATE OF ECONOMIC SECURITY IN THE REGION**

*Based on the analysis of a sample of primary indicators of regional social-economic activity within the framework of the nonlinear mathematical model created the degree of crisis, characterizing economic security in general, is determined. The problem is solved by the functions that indicate the presence definite types of crisis conditions of the whole system and, consequently, on its stability. The following synergistic characteristics are studied: visual status and its dynamics data; potential functions of the data, showing the relative stability of regional economics states and their transformation during the analyzed period. The software is developed and numerical calculations for the Sverdlovsk region in the period of 2000-2012 are carried out.*

**Economic security, GRP, the crisis degree, nonlinear analysis, the potential function, stability, severity of the condition, numerical modeling.**