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ANALYSIS OF MODERN APPROACHES TO THE FORMATION OF THE PORTFOLIO INVESTOR SHARES STOCK

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The object of research is an investment portfolio consisting of a set of investment instruments (securities, assets, projects, etc.) in which the investor's finances are distributed. The main purpose of forming an investment portfolio is its maximum return, but income is always directly proportional to risk. The paper proposes an approach in which the user can manage the values of profitability and risk, and thus determine for himself the optimal composition of the investment portfolio. This is achieved by using a combination of financial asset valuation methods.

The study used models that are the basis of portfolio theory and include the choice of investment assets and the optimization of the composition of the portfolio, methods for assessing the investment qualities of assets and the effectiveness of portfolio investment. In particular, Markowitz, Sharpe and Tobin models are used to ensure greater efficiency in making investment decisions in the stock market, including those related to the formation and management of the share portfolio. And in assessing the investment qualities of financial assets.

Tests of the method and models on real investment assets have confirmed their effectiveness. In particular, when forming a portfolio of shares, it is determined that the maximum profitability is ensured in the investment portfolio, which is characterized by the maximum risk. Compared to other variants of portfolios with average and minimum returns, it is determined that the value of risks differ by 3–5 %. This is due to the fact that the proposed method is based on a combination of models that take into account various aspects of the stock market. Thus, an optimal portfolio is formed that provides the investor with the desired level of profitability at a fixed level of risk.

The results obtained in this work allow to propose a general methodology for the formation of an optimal investment portfolio containing various shares of the most reliable and attractive financial assets in the conditions of modern uncertainty and volatility of the Ukrainian stock market.

Keywords: investment portfolio, portfolio investment, shareholding, investment company.

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SYSTEMS AND CONTROL PROCESSES

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MODELING OF REGULATION OF THE TRANSPORT FLOW AT THE ENTRANCE ON THE BRIDGE IN THE AnyLogic ENVIRONMENT

page 10–16

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The object of research of this work is the traffic flow and its parameters in a critical, in terms of traffic congestion, area

of the city, namely at the entrance to the bridge that connects the right and left banks of the Dnipro River (Dnipro, Ukraine). A problem arising in the formation of traffic flows to the bridge is the occurrence of congestion due to the physical limitation of the carrying capacity of the bridge. The peculiarity of the traffic interchange near the bridge is that it is impossible to expand the roadway to increase the traffic capacity without a major overhaul. In addition, the surrounding infrastructure maintains an intense pedestrian flow, which is wedged into the traffic flow in arbitrary locations, which leads to a breakdown of the flow structure or its stopping. There are also several additional factors that complicate the flow structure and delay it. The solution that can improve the situation at the lowest cost is the introduction of automatic regulation of traffic and pedestrian traffic in critical places.

To determine the regulation points and their modes of operation, an analysis of the transport environment in the area of entry to the bridge was carried out using field research. The modeling of traffic flows was carried out using the software package and the mode of operation of the traffic light was chosen.

Statistics were obtained regarding traffic flows along adjacent streets and the traffic flow was schematized. The location of the traffic light and the time intervals of its work, which allow to minimize congestion on adjacent streets and increase the speed of travel, have been determined.

A special feature of the study was the use of the powerful AnyLogic package for modeling, which contains a specialized module for working with traffic flows. Its application made it possible to create a movement model and conduct a series of experiments, according to the results of which time intervals of regulation were obtained.

Keywords: automatic regulation of traffic flows, optimization of the city's transport system, modeling using the AnyLogic package.

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RESEARCH OF THE CONDITIONS OF USING AN EXPERIMENTAL METHOD FOR CARRYING OUT QUALITY CONTROL AND QUANTITATIVE EVALUATION OF THE STABILITY OF RADIO ELECTRONIC MEANS TO THE IMPACT OF POWERFUL ELECTROMAGNETIC RADIATION

page 17–25

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The object of research is the REM functioning when it is irradiated with PEMI.

One of the most problematic issues is the lack of a general methodology for quantifying the REM sustainability to the destructive effect of the intensity of the field of electromagnetic field. Therefore, this study is devoted to determining the conditions for the use of an experimental methodology for the quality control and quantitative assessment of the REM resistance to the PEMI action.

In the course of the study, a technique was used that contains methods of theoretical generalization, analysis and synthesis, a method for representing nodes (parts) of REM using equivalent circuits, and a method for analyzing the stability of its nodes (parts, devices) separately. Modern REMs consist of many devices of various functional purposes. Each of the devices contains a large variety of links and elements. Therefore, the assessment of the REM sustainability by a block-by-block study of the stability of its nodes (parts, devices) will allow to evaluate the degree of PEMI impact on various nodes and the entire REM by separate parameters. In particular, the parameters characterizing the jamming environment created by the REM nodes, and the parameters characterizing the susceptibility degree of the various parts (nodes) of the REM to the effects of electromagnetic radiation.

The applied nature of the proposed technique is the determination of the conditions for the use of various test methods related to the determination of the REM resistance to the PEMI impact, providing the following advantages:

– a higher degree of reliability of the results obtained in shorter periods of time;

– use of new, more noise-resistant types of communication between individual CME parts and the investigated REM when creating measurement stands.

The research results allow to understand the order, the conditions of the experimental tests and the CME requirements. This will allow in subsequent studies to assess the stability of both a separate unit and the REM as a whole.

Keywords: powerful electromagnetic effect, radiotechnical means, stability evaluation of radio-electronic means.

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MATHEMATICAL MODELING OF CURTAIN GROUTING PARAMETERS FOR THE ROADWAYS FLOODING PREVENTION

page 25–30

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The object of research is the process of flooding the roadway in the zone of influence of irrigation fields. One of the most problematic places is the influence of such technogenic factors on the groundwater level as irrigation fields and roads, the prevailing natural factors. Excess moisture content reduces the carrying capacity of the soil, which leads to accelerated destruction and shortening of the road life. In such cases, a road with drainage problems requires more frequent repair and rehabilitation than the one on which the drainage system is functioning normally. Therefore, the cost of the device coverage should be compared with the cost of supporting wastewater. To maintain the roads and prevent their flooding, constant monitoring of the state of the groundwater level (GWL) and a forecast of its changes are necessary.

In the course of research, mathematical methods are used (analytical solution of differential filtration equations involving the Maple computer program) for mathematical modeling of the curtain grouting parameters. As well as methods of environmental and economic assessment and comparative analysis to determine significant factors influencing the GWL and the impact of GWL on the environment.

An engineering measure is proposed to protect the roadway from the harmful effects of groundwater, providing for the establishment of curtain grouting along the road. The mathematical modeling of the parameters of the curtain grouting, which will make it possible to effectively use the curtain grouting in the fight against flooding.

From the Polubarinova-Kochina equation of the liquid medium motion, the Dupuit equation is obtained, which was used to solve the stationary problem of determining the flow rate of water through the curtain grouting. Then it is solved the stationary problem of determining the flow rate of water through the curtain grouting. It is established that the use of curtain grouting is effective even at such parameters: $K_f \leq 0.7$ m/day, with a greater length and a smaller deepening of the curtain itself. The obtained calculations of the parameters will allow the use of curtain grouting in various industries to protect against flooding of various objects.

Keywords: road flooding, irrigation fields, filtration coefficient, mathematical model of curtain grouting parameters.

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DEVELOPMENT OF THE METHODOLOGY OF THE CHOICE OF THE ROUTE OF WORK OF PLATFORM SUPPLY VESSELS IN THE SHELF OF THE SEAS

page 30–35

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The object of research is specialized vessels servicing production platforms (SPV) in the shelves of the seas. One of the most problematic places is the need to improve the efficiency of specialized service vessels for transporting personnel, building materials and supplies to oil platforms in the sea shelves during the operation of platforms for oil production.

In the course of the study, in order to improve the SPV operation of the production platforms, the method of variants and the routing of the operation of vehicles were used to develop the methodology. This allowed to improve the work of the SPV in the maintenance of production platforms, due to the reduction in the cost of voyage.

The best way to organize the SPV operation in the maintenance of mining platforms in the Black Sea shelf is received. Namely, possible routes of SPV operation were compiled during the pendulum and group-delivery mode of operation, and the best way of SPV operation for the best route was determined according to the chosen criterion. The economic effect of the SPV operation on the selected route and method, which amounted to about 44 000 dollars for the voyage. This result is due to the fact that the developed methodology for the selection of the best version of the SPV has a number of features, in particular, it consists of successive stages:

– select route schemes for the organization of the work of environmental protection;

– compiled options for routes of SPV operation for each scheme;

– selection criterion is assigned;

– calculated performance of the vessels;

– the optimal route and scheme are selected according to the adopted optimization criterion.

The developed methodology provides the determination of the optimal route and a variant of the operation scheme of the SPV, which provides the lowest value of the cost of transportation of 1 ton-km of cargo. Compared with similar known methods that are used in road transport, similar methods have not been used in the offshore oil business.

Keywords: specialized vessels servicing production platforms, offshore drilling platforms, variants of work routes.

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MODELING OF THE OPTIMAL COMPOSITION OF THE ENTERPRISE TECHNICAL DEVELOPMENT PROGRAM

page 36–41

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The object of this research is the program of technical development of the enterprise. This research is devoted to the problem of forming the optimal composition of a technical development program within the framework of its scope management on the basis of the concept of a value approach, according to which the project's value is its compliance with the development goals. The principle of forming the composition of a technical development program is based on ensuring the maximization of the program's value in terms of a given set of technical development goals.

A method for assessing the value of technical development projects has been developed, based on the use of fuzzy sets, as a result of which two assessments of the project value are formed – the project's contribution to the achievement of each goal from a variety of goals and the degree of this contribution. Such approach allows one to take into account not only the fuzzy meaning of the results, but also to take into account in the processes of program formation the «uncertainty» degree of the overall result in terms of each goal.

Description of a quantitative assessment of the synergy effect is formalized in terms of the theory of fuzzy sets that arises from the joint implementation of projects within the program, which allows a greater confidence degree to evaluate the result of the program.

A model has been developed for the formation of the optimal composition of a technical development program taking into account the value of projects and the system effect (synergy) of their joint implementation within the program. The model provides for the ranking of goals, which is used when establishing minimum boundaries for the achievement degree of a particular goal, which corresponds to the actual process of selecting projects in practice.

Using the proposed approach to assessing the contribution of projects to achieving goals, as well as a model for optimizing the composition of the program, it is possible to form a program from a proposed set of projects. At the same time, the achievement of goals is ensured to the maximum extent, taking into account the uncertainty of both the conditions for the implementation of projects and their results.

The application of the proposed model can be extended to programs of various orientations.

Keywords: technical development program, fuzzy sets, project value, scope management.

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MATHEMATICAL MODELING

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MINIMIZATION OF CONJUNCTIVE NORMAL FORMS OF BOOLEAN FUNCTIONS BY COMBINATORIAL METHOD

page 42–55

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The object of research is the combinatorial method of minimizing conjunctive normal forms (CNF) of Boolean functions in order to reduce its algorithmic complexity. One of the most places to minimize CNF of Boolean functions is the complexity of the minimization algorithm and the guarantee of obtaining the minimum function.

In the course of the study, the method of equivalent figurative transformations based on the laws and axioms of the algebra of logic, protocols for minimizing CNF of Boolean functions is used.

The reduction of the computational complexity of the process of minimization of the CNF of the Boolean functions by the combinatorial method according to the new established criteria has been obtained, thanks to the use of a number of features of the algorithm for finding minimal disjunctive normal forms (DNF) and CNF of logical functions, in particular:

– the use of the mathematical apparatus of transforming flowcharts with repetition allows to increase the information component of the figurative transformation with respect to the orthogonality, adjacency, uniqueness of truth table blocks;

– equivalent figurative transformations allow with the effect to replace verbal procedures of algebraic transformations due to the greater information capacity of matrix images;

– result of minimization is estimated on the basis of the minimal function;

– minimal DNF or CNF of the functions are obtained regardless of the normal form of the given logical function;

– minimization protocols for CNF of Boolean functions make up a library of protocols for the process of minimization of CNF of Boolean functions as standard procedures.

Due to the above, it is possible to optimally reduce the number of variables of a given function without losing its functionality. The effectiveness of the use of figurative transformations is demonstrated by examples of minimizing functions borrowed from other methods for the purpose of comparison.

Compared with similar known methods of minimizing Boolean functions, the proposed method allows:

– reduce the algorithmic complexity of minimizing CNF of Boolean functions;

– increase the visibility of the minimization process of DNF or CNF of Boolean functions;

– ensure the self-sufficiency of the combinatorial method of minimizing Boolean functions by introducing features of the minimal function and minimization on the full table of DNF and CNF.

Keywords: minimization of conjunctive normal forms, combinatorial method of minimizing Boolean functions, block diagram with repetition.

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