MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Autonomous Educational Institution of Higher Education

"Moscow Polytechnic University"

(Moscow Poly)

APPROVE
Vice-President
for International Affairs
/Yu.D. Davydova/
"30" 05 2022

Dean,
Faculty of Economics and Management
/A.V. Nazarenko/
"30" 05 2022

WORKING PROGRAM OF THE DISCIPLINE

"Organizational System Simulation"

Field of study
38.03.02 Management

Educational program (profile)
"Business Process Management"

Qualification (degree)
Bachelor

Form of study
Part-time

Moscow 2022

one. The goals of mastering the discipline.

Main goalaboutWithinstudy of the discipline "Modeling of organizational systems" - consideration of the theoretical foundations and patterns of building and functioning of systems, including economic, methodological principles of their analysis and synthesis, the application of the studied patterns to develop systemic approaches to decision-making.

The main tasks of mastering the discipline "Modeling of organizational systems" include:

- familiarization with the basic concepts and definitions of systems, the structure and general properties of systems, the factors of influence of the external environment, the possibilities and main approaches to using system analysis at the organization level;
- the acquisition by students of theoretical knowledge on a systematic approach to the study of systems and practical skills in their modeling;
- the acquisition by students of practical knowledge on the basic methods used in system analysis.

2.The place of the discipline in the structure of the bachelor's program

The discipline "Modeling of organizational systems" is one of the elective disciplines of the part (B1.2.ED.6.1) of the bachelor's degree program. The discipline "Modeling of organizational systems" is interconnected logically and methodically with the following disciplines and practices of the EP:

*AT*variable part of disciplines (B1.2):

- Management of organizational changes;

*AT*parts of elective disciplines (B1.3):

- Management of subject-object relations in business processes;
- Reengineering of business processes;
- System management of business processes.

3.The list of planned learning outcomes for the discipline (module), correlated with the planned learning outcomes **educational**programs.

As a result of mastering the discipline, students form the following competence and the following learning outcomes should be achieved as a stage in the formation of the relevant competence:

The codecompetencies	**AT**as a result of mastering the educational program, the student must have	**Scroll**planned learning outcomes in the discipline

UK-1	Able to search, critically analyze and synthesize information, apply a systematic approach to solve tasks	**IUK-1.1.**Analyzes the task, highlighting its basic components. **IUK-1.2.**Carries out a search, critically evaluates, generalizes, systematizes and ranks the information required to solve the problem. **IUK-1.3.**Considers and offers rational options for solving the task, using a systematic approach, critically assesses their advantages and disadvantages.
OPK - 2	Able to collect, process and analyze the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems	**IOPC-2.1.**Knows the methods of collecting, processing and analyzing data necessary to solve the set management tasks, using modern tools and intelligent information and analytical systems. **IOPC-2.2.**Able to collect, process and statistically analyze the data necessary to solve the set management tasks, using modern tools and intelligent information and analytical systems. **IOPC-2.3.**He has the skills to collect, process and analyze the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems.

Part-time education

The total labor intensity of the discipline is 5 credit units, i.e. 180 academic hours (of which 144 hours are independent work of students). The discipline is studied in the fourth year.

Ninth semester:lectures - 18 hours, seminars and practical classes - 18 hours, the form of control - an exam.

The structure and content of the discipline "Modeling of organizational systems" in terms of terms and types of work are reflected in the appendix.

Contentdiscipline sections

Topico n e . Introduction to the discipline. Basic definitions. Concepts characterizing systems

Lecture 1. Introduction to the discipline. Basic definitions: system, system element, connection, subsystem, purpose, structure, types of structures, control system, cybernetic system, system analysis, system approach.

Lecture 2. Concepts that characterize systems: state, balance, development,

stability. Classification of systems: the goal of any classification, by interaction With envatreaping Withredoy, aboutWithnovation classassclassifications, names of system classes, distinguishing features of classes, examples of classes.

Seminar 1. Fundamentals of systems theory: system and its components, representation forms, purpose of functioning. Concepts characterizing the structure and functioning of systems: elements, variables, parameters, system states, system behavior, program. Classification and patterns of systems. Formalized models of system analysis.

Topic 2. System approach and its main principles

Lecture 3. System approach and its main principles. Fundamentals of the system approach: system approach, system objects, feed-forward, feedback, positive feedback, negative, feedback coefficient. Principles of a systematic approach: the principle of integrity, the principle of compatibility of elements in the system, the principle of organization, the principle of purposefulness and expediency.

Lecture 4 The principle of complementarity and continuity of the processes of design and implementation of complex systems, the principle of taking into account the dynamics of the system.

Seminar 2. Scheme of procedures for system analysis. Principles of system analysis. Pabutframe metods Withsystemic acash. Choice methendow modeling. Methods of formalized representation of systems. Direct resource allocation problem based on linear programming.

Topic 3. Models and methods of system analysis

Lecture 5. Models and methods of system analysis. Model as the main tool andssresearch Withsystem: goodabout Withtukturized problem, unstructuredproblemax, weakly structured problems, model, modeling of economic systems, experimental problem, meaningful statement of the problem, stages of practical modeling, classification of mathematical models, analytical mathematical models, algorithmic mathematical models.

Lecture 6. Methods of formal representation of systems: analytical, statistical, graphic. Information approach to systems analysis: information, entrancednaya inphormation, exiton theI andinformation, ininternal, intrasystem, amount of information.

Seminar 3. Features of the application of the dual LP problem for the analysis of the economic system. Variants of transport tasks (TS). Criteria for choosing a goal and optimality of traffic flows. The sequence of solving the transport problem according to the cost criterion.

Topic four. Specific Models of System Analysis

Lecture 7. Specific models of system analysis. Family standards IDEF one. Kinds WithstandardsIDEF: fatlocal bleye, dominance, interface arc, arc ramifications

Lecture 8. IDEF0 methodology: arc merging, decomposition, stable subsystems, tunneling. The process of creating an IDEFO model: the main stages of the process, choosing a goal and point of view, compiling a list of data, compiling a list of features, constructing a diagram, decomposition and refinement, evaluation of the model. IDEF3 methodology: purpose of IDEF3, types of diagrams in IDEF3, classification of types of intersections, basic principles of ontological analysis, concepts of IDEF5, types of diagrams and diagrams of IDEF5.

Seminar 4. Organization and assessments of complex examinations: coefficients of concordance, Spearman and confusion. Methods for conducting expert procedures. Calculation of weight coefficients of criteria.

Topic 5. Analysis and formation of system goals

Lecture 9. Analysis and formation of system goals. Purpose and its characteristics.

Lecture 10. Analysis of goals. Synthesis of goals (goal setting).

Seminar 5. Solving the problem of optimizing the organization's production plan. Modeling the functioning of the organization when changing resources and structure..

Topic 6. Fundamentals of decision theory

Lecture 11

Lecture 12. Experts. Methods of organizing group examinations. Seminar 6. System analysis and modelingWithstrategic planning and management. Solving the problem of choosing a strategy, taking into account synergy, effects and costs. Particular problems of system analysis.

Topic7. Management Decision Making

Lecture 13. General characteristics of the operational management of the main production and a set of subsystem tasks.

Lecture fourteen. XaRacteristics hadachas operationally - toaLendar planning of the main production.

Seminar 7. System dynamics. The concept of analysis of resource flows by dynamic equations. Dynamics of development of business organizations.

Topic eight. Modeling of organizational systems by production

Lecture 15. Modeling organizational systems. The concept of management.

Lecture 16. Principles of control theory. Control functions.

Seminar 8. Solving typical problems for calculating the probabilities of system states, calculating technological and economic efficiency.

Topic9 . Modeling organizational systems by the economic activities of the organization

Lecture 17

Lecture 18. Analysis and evaluation of organizational management structures.

Seminar 9. Indicators of the effectiveness of economic activity. Modeling of organizational systems by the investment activity of the organization.

5.Educational technologies

The methodology for teaching the discipline "Modeling Organizational Systems" and the implementation of a competency-based approach in the presentation and perception of the material provides for the use of the following active and interactive forms of conducting group, individual, classroom classes in combination with extracurricular work in order to form and develop the professional skills of students:

– discussion of reports on the discipline.

6.Evaluation tools for current monitoring of progress, intermediate certification based on the results of mastering the discipline and educational and methodological support for students' independent work.

In the learning process, the following assessment forms of independent work of students, assessment tools for monitoring progress and intermediate assessments are used:

- Reports for self-fulfillment.

Samples of control questions and tasks for conducting current control, questions for the exam are given in the appendix.

Types of educational work provided for by the work program of the discipline.

When performing current control, it is possible to use test material. Samples of control questions and tasks for conducting current control are given in the appendix. When implementing the undergraduate program, the organization has the right to use e-learning and distance learning technologies. All materials are placed in the LMS of the Moscow Poly (https://online.mospolytech.ru/).

When teaching people with disabilities, e-learning and distance learning technologies should provide for the possibility of receiving and transmitting information in forms accessible to them.

6.1. Fund of assessment tools for conducting intermediate certification of students in the discipline (module).

6.1.1. A list of competencies indicating the process of mastering the educational program.

AT ReAs a result of mastering the discipline, the following competencies are formed:

The codecompetencies	**AT**as a result of mastering the educational program, the student must have
UK-1	Able to search, critical analysis and synthesis of information, apply a systematic approach to solving tasks.

OPK - 2	Able to collect, process and analyze the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems.

In the process of mastering the educational program, these competencies, including their individual components, are formed in stages in the course of mastering disciplines by students in accordance with the curriculum and calendar schedule of the educational process.

6.1.2. Description of indicators and criteria for assessing competencies formed on the basis of the results of mastering the discipline (module), description of assessment scales

Byindicator otsenivy competendencies na Raevil thisagroin formation is the achievement by students of the planned learning outcomes in the discipline (module).

UK-1 Able to search, critical analysis and synthesis of information, apply a systematic approach to solve problems. tasks				
Index	**Criteria**evaluation			
	2	**3**	**four**	**5**
IUK-1.1. Analyzes the task, highlighting its basic components.	The student demonstrates the complete absence or insufficient correspondence of the following knowledge: analyzes the task, highlighting its basic components.	The student demonstrates incomplete correspondence of the following knowledge: analyzes the task, highlighting its basic components.	The student demonstrates partial compliance with the following knowledge: analyzes the task, highlighting its basic components.	The student demonstrates full compliance with the following knowledge: analyzes the task, highlighting its basic components. Freely operates with acquired knowledge.

IUK-1.2. Carries out a search, critically evaluates, generalizes, systematizes and ranks the information required to solve the problem.	The student does not know how or insufficiently to search, critically evaluate, generalize, systematize and rank the information required to solve the task.	The student demonstrates incomplete compliance with the following skills: to search, critically evaluate, summarize, systematize and rank the information required to solve the task.	The student demonstrates partial compliance with the following skills: to search, critically evaluate, summarize, systematize and rank the information required to solve the problem.	The student demonstrates full compliance with the following skills: to search, critically evaluate, summarize, systematize and rank the information required to solve the problem.
IUK-1.3. Considers and offers rational options for solving the task, using a systematic approach, critically assesses their advantages and disadvantages.	The student does not own or insufficiently owns the consideration and proposal of rational options for solving the problem, using a systematic approach, critically evaluating their advantages and disadvantages.	The student partially owns the consideration and proposal of rational options for solving the task, using a systematic approach, critically evaluating their advantages and disadvantages, The student experiences significant difficulties in applying skills in new situations.	The student owns the consideration and proposal of rational options for solving the task, using a systematic approach, critically evaluating their advantages and disadvantages, but minor errors, inaccuracies, difficulties are made in analytical operations, transferring skills to new, non-standard situations.	The student fully owns the consideration and proposal of rational options for solving the task, using a systematic approach, critically evaluating their advantages and disadvantages, freely applies the acquired skills in situations of increased complexity.
PC-7-Able to form possible solutions based on the target indicators developed for them, as well as to analyze, justify and select solutions				
Index	**Criteria**evaluation			
	2	**3**	**four**	**5**

IOPC-2.1. Knows the methods of collecting, processing and analyzing data necessary to solve the set management tasks, using modern tools and intelligent information and analytical systems.	The student demonstrates the complete absence or insufficient compliance of the following knowledge: methods of collecting, processing and analyzing data necessary to solve the set management tasks, using modern tools and intelligent information and analytical systems. .	The student demonstrates incomplete compliance with the following knowledge: methods of collecting, processing and analyzing data necessary to solve the set management tasks, using modern tools and intelligent information and analytical systems. Significant mistakes are made, lack of knowledge is manifested, for a number of indicators, the student experiences significant difficulties in operating knowledge when transferring it to new situations.	The student demonstrates partial compliance with the following knowledge: methods for collecting, processing and analyzing data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems, but minor errors, inaccuracies, and difficulties in analytical operations are allowed.	The student demonstrates full compliance with the following knowledge: methods of collecting, processing and analyzing data necessary to solve the set management tasks, using modern tools and intelligent information and analytical systems. Freely operates with acquired knowledge.
IOPC-2.2. Able to collect, process and statistically analyze the data necessary to solve the set management tasks, using modern tools and intelligent information and analytical systems.	The student does not know how or insufficiently knows how to collect, process and statistically analyze the data necessary to solve the set management problems, using modern tools and intelligent information and analytical systems.	The student demonstrates incomplete compliance with the following skills: to collect, process and statistically analyze the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems. Significant mistakes are made, lack of knowledge is manifested, operating knowledge when transferring it to new situations.	The student demonstrates partial compliance with the following skills: to collect, process and statistically analyze the data necessary to solve the set management tasks, using modern tools and intelligent information and analytical systems. but minor errors, inaccuracies,	The student demonstrates full compliance with the following skills: to collect, process and statistically analyze the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems. Freely operates with acquired knowledge

IOPC-2.3. He has the skills to collect, process and analyze the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems.	The student does not possess or insufficiently possesses the skills to collect, process and analyze the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems.	The student partially owns the skills of collecting, processing and analyzing the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems. The learner experiences significant difficulties in applying skills in new situations.	The student has the skills to collect, process and analyze the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems, but minor errors, inaccuracies, difficulties in analytical operations, transferring skills to new, non-standard situations are allowed.	The student is fully trained in the skills of collecting, processing and analyzing data necessary to solve the set management tasks, using modern tools and intelligent information and analytical systems. Freely applies acquired skills in situations of increased complexity.

Scalesa b o u t **appreciation results**P **intermediate attestations and them**description:

Form of intermediate certification: exam.

Intermediate certification of students in the form of an exam is carried out based on the results of all types of educational work provided for by the curriculum for a given discipline (module), while taking into account the results of current monitoring of progress during the semester. The assessment of the degree of achievement by students of the planned learning outcomes in the discipline (module) is carried out by the teacher conducting classes in the discipline (module) by the method of expert assessment. Based on the results of the intermediate attestation for the discipline (module), an assessment is given: "excellent", "good", "satisfactory" or "unsatisfactory".

Only students who have completed independent work are allowed to interim attestation.

Evaluation scale	*Description*
Excellent	*Independent work was done, test tasks were passed, active participation in a business game, performance of other types of work provided for by the curriculum. The student demonstrates the correspondence of knowledge, skills and abilities given in the tables of indicators, operates with the acquired knowledge, skills, skills, applies them in situations*

	of increased complexity. In this case, minor errors, inaccuracies, difficulties in analytical operations, transferring knowledge and skills to new, non-standard situations can be made.
Good	*Independent work was done, test tasks were passed, active participation in a business game, and other types of work provided for by the curriculum. The student demonstrates incomplete, correct correspondence of knowledge, skills, and abilities given in the tables of indicators, or if 2-3 minor errors were made at the same time.*
Satisfactorily	*Independent work was done, test tasks were passed, participation in a business game, and other types of work provided for by the curriculum. The student demonstrates the conformity of knowledge, which covers the main, most important part of the material, but at the same time one significant error or inaccuracy was made.*
unsatisfactory	*Completed independent work in the form of a scientific report, not fully participating in the classroom work provided for by the curriculum. The student demonstrates incomplete correspondence of knowledge, skills and abilities given in the tables of indicators, significant errors are made, lack of knowledge, skills, skills is manifested in a number of indicators, the student experiences significant difficulties in operating knowledge and skills.*

7.Educational-methodical and information support of the discipline.

a)Main literature:

1. Prokofieva, T. A. System analysis and modeling in management: a textbook for universities - Moscow: Yurayt Publishing House, 2021. - 313 p. - ISBN 978-5-534-10451-6. — Text: electronic // Educational platform Urayt [website]. — URL: https://urait.ru/bcode/475448

2. Zagranovskaya A. V. System analysis and modeling: a textbook for universities - M .: Yurayt Publishing House, 2021. - 424 p. - (Higher education). — ISBN 978-5-534-13893-1. — Text: electronic // Educational platform Urayt [website]. - url:https://urait.ru/bcode/467205

b)additional literature:

1. Belov P. G. System analysis and modeling and program-target risk management: textbook and workshop for universities / P. G. Belov. - Moscow: Yurayt Publishing House, 2021. - 289 p. - (Higher education). - ISBN 978-5-534-04690-8. — Text: electronic // Educational platform Urayt [website]. — URL: https://urait.ru/bcode/473132

2.Trushkova A.Yu. Management. Applied aspects: textbook - 3rd ed. - Moscow: FLINTA, 2017. - 134 p. — ISBN 978-5-9765-3404-9. - Text: electronic // Electronic library system "Lan": [website]. - URL: https://e.lanbook.com/book/97146

in) softwaresoftware and Internet resources:

Software and Internet Resources:

Office applications, Microsoft Office 2013 (or lower) -Microsoft Open License - License No. 61984042 Agreement No. 08-05/13 dated 06/03/2013 Transfer and Acceptance Certificate No. 961, Transfer and Acceptance Certificate No. 385

Operating system, Windows 7 (or lower) - Microsoft Open License - License No. 61984214, 61984216, 61984217, 61984219, 61984213, 61984218, 61984215; Agreement No. 08-05/13 dated 06/03/2013 Transfer and Acceptance Certificate No. 961

- http://www.gov.ruServer of state authorities of the Russian Federation.
- http://www.mos.ruOfficial server of the Government of Moscow.
- http://www.garant.ruGUARANTOR Legislation with comments.
- http://www.gks.ruFederal State Statistics Service.
- http://www.rg.ruRussian newspaper.
- http://www.rbc.ruRBC (RosBusinessConsulting).
- http://www.businesspress.ruBusiness press.
- http://uisrussia.msu.ruUniversity Information System of Russia.
- http://www.mevriz.ruJournal "Management in Russia and abroad"
- http://minpromtorg.gov.ru/Ministry of Industry and Trade of the Russian Federation.

eight. Logistics support of discipline.

Audience for lectures and seminars of the general fund. Training tables with benches, classroom board, portable multimedia complex (projector, projection screen, laptop). Teacher's workplace: table, chair.

Office applications, Microsoft Office 2013 (or lower) -Microsoft Open License - License No. 61984042 Agreement No. 08-05/13 dated 06/03/2013 Transfer and Acceptance Certificate No. 961, Transfer and Acceptance Certificate No. 385

Operating system, Windows 10 (or lower) - Microsoft Open License -License No. 61984214, 61984216, 61984217, 61984219, 61984213, 61984218, 61984215; Contract No. 08-05/13 of 06/03/2013 Transfer and Acceptance Certificate No. 961

9.Guidelines for students when working on lecture notes during a lecture

Lecture - a systematic, consistent, monologue presentation by the teacher of educational material, as a rule, of a theoretical nature. When preparing a lecture, the teacher is guided by the working program of the discipline. In the course of lectures, it is recommended to keep a summary, which will later allow you to recall the studied educational material, to supplement the content during independent work with literature.

You should also pay attention to categories, formulations that reveal the

content of certain phenomena and processes, scientific conclusions and practical recommendations, positive experience in oratory. It is advisable to leave in the working notes the fields on which to make notes from Recommanded litaseratura, additionalIing mathe material of the lecture, as well as emphasizing the special importance of certain theoretical positions.

Lecture conclusions summarize the teacher's reflections on the curriculum. questionsam.EtcePgiver leads Withsqueak andWithusedand petorecommended sources for studying a particular topic. At the end of the lecture, students have the opportunity to ask questions to the teacher on the topic of the lecture. When lecturing on the discipline, electronic multimedia presentations can be used.

methodicalinstructions for trainees when working at the seminar Seminars are implemented in accordance with the working curriculum with consistent study of the topics of the discipline. In preparation for the seminars, the student is recommended to study the basic literature, read additional literation, newsmi Patglare in Periodic publications: magazines, newspapers, etc. In this case, the recommendations of the teacher and the requirements of the curriculum should be taken into account. It is also recommended to refine your lecture notes by making appropriate entries in it from the literature recommended by the teacher and provided by the curriculum. Abstracts should be prepared for presentations on all educational issues submitted to the seminar.

Since the student's activity in seminars is the subject of monitoring his progress in mastering the course, preparation for seminars requires a responsible attitude. In interactive classes, students should be active.

methodical instructions for students Pabout organizationsindependent work

Independent work of students is aimed at independent study of a separate topic of the academic discipline. Independent work is mandatory for each student, its volume is determined by the curriculum. During independent work, the student interacts with the recommended mamaterials at atparts Prepogiver in inidea of consultation. The electronic library system (electronic library) of the university provides the possibility of individual access for each student from any point where there is access to the Internet.

ten. Guidelines for the teacher (Methodological recommendations for making presentations)

A presentation (from the English word - presentation) is a set of color slide pictures on a specific topic, which is stored in a special format file with the PP extension. The term "presentation" (sometimes called "slide film") is associated primarily with the information and advertising functions of pictures that are designed for a certain category of viewers (users).

Multimedia computer presentation is:• ddynamic synthesis of text, image, sound;

- saour modern software interface technologies;
- interrorist contact of the speaker with the demonstration material;
- mobility and toohmpact informarational nbearers and equipmentatdovaniya;
- WithPability to update, supplement and adapt information;- nehigh price.

Rules for designing computer presentations General design rules

Many designers argue that there are no laws and rules in design. There are tips, tricks, tips. Design, like any kind of creativity, art, like any way of some people to communicate with others, like language, like thought, will bypass any rules and laws.

However, there are certain recommendations that should be followed, at least for novice designers, until they feel the strength and confidence to create their own rules and recommendations.

Font design rules:

- Serif fonts are easier to read than sans-serif fonts;
- Capital letters are not recommended for body text.
- Font contrast can be created through: font size, font weight, style, shape, direction, and color.
- Rules for choosing colors.
- The color scheme should consist of no more than two or three colors.- There are incompatible color combinations.
- Black color has a negative (gloomy) connotation.
- White text on a black background is hard to read (inversion is hard to read).

Presentation design guidelines

In order for the presentation to be well perceived by the audience and not cause negative emotions (subconscious or completely conscious), it is necessary to follow the rules for its design.

The presentation involves a combination of information of various types: text, graphics, musical and sound effects, animation and video clips. Therefore, it is necessary to take into account the specific
combining pieces of information of various types. In addition, the design and demonstration of each of the listed types of information is also subject to certain rules. So, for example, for textual information, the choice of font is important, for graphic information - brightness and color saturation, for their best joint perception, optimal relative position on the slide is necessary.

Consider recommendations for the design and presentation of various types of materials on the screen.

Formatting text information:

- RaFont size: 24-54 pt (headline), 18-36 pt (plain text);
- cthe font color and background color should contrast (the text should be well read), but not hurt the eyes;
- font type: smooth sans-serif font for body text (Arial, Tahoma, Verdana), decorative font can be used for heading if it is legible;
- italics, ondscribbling, fatty font, propiWithnye batit is recommended to use qua only for semantic selection of a text fragment.

Formatting graphic information:

- Rpictures, photographs, diagrams are designed to supplement textual information or convey it in a more visual form;
- it is desirable to avoid drawings in the presentation that do not carry a semantic load if they are not part of the style design;
- cThe color of graphic images should not contrast sharply with the overall style of the slide;
- illustrations are recommended to be accompanied by explanatory text;
- euIf a graphic image is used as a background, then the text on this background should be well readable.

The content and location of information blocks on the slide:- andthere should not be too many information blocks (3-6);

- Retorecommended size of one information block - no more than 1/2 of the slide size;
- desirable etcandWithateffect na Withtranice blockaboutin With Ranotypic information (text, graphs, diagrams, tables, figures) that complement each other;
- keywords in the information block must be highlighted;
- andit is better to place information blocks horizontally, blocks related in meaning - from left to right;
- naforThe most important information should be placed in the center of the slide;
- the logic of presenting information on slides and in the presentation should correspond to the logic of its presentation.

In addition to the correct arrangement of text blocks, one must not forget about their content - the text. In no case should it Withrefrain from spelling mistakes. You should also take into account the general rules for formatting the text.

ByWithleWithbuildings PRezentation and her designedenia, neit is necessary to rehearse her presentation and her speech, check how the presentation will look like as a whole (on a computer screen or a projection screen), how quickly and adequately it is perceived from different places in the audience, with different lighting, noise, in an environment as close as possible to real performance conditions.

The work program was compiled on the basis of the Federal State Educational Standard of Higher Education in the direction of training bachelors on March 38, 02 "Management", approved by order of the Ministry of Education and Science of the Russian Federation of August 12, 2020 No. 970 (Registered in the Ministry of Justice of Russia on August 25, 2020 No. 59449).

program Withleft:
Candidate of Economics, Associate Professor of the Department of Management /

Korotun O.N. /

Program approved on the meetings Department of "Management"
"29" August 2022, Protocol No. 1

Head of the Department "Management"
k. e. PhD, Associate Professor / Alenina E.E. /

Attachment

Structure anddiscipline content
"Modeling Organizational Systems"
on direction38.03.02 "Management" (bachelor) educational program
"Business Process Management"
full-time-extramural studies

Rsection	**Semester**	**A weeksem**	**Kinds**academic work, including independent work of students, **and**labor intensity in hours					**Kinds**independent work **students**					**Forms**attestations	
			L	F/N	Lab	SRS	DAC	K.R.	K.P.	K/R	T	DC	E	Z
Topic1. Introduction to the discipline. Basic definitions. Concepts characterizing systems	9		2	2		fourt een						+		
Topic2. System approach and its main principles	9		2	2		fourtee						+		
Topic3. Models and methods of system analysis	9		2	2		fourtee								
Topic4. Specific models of system analysis	9		2	2		fourtee						+		
Topic5. Analysis and formation of system goals	9		2	2		fourtee						+		
Topic6. Fundamentals of decision theory	9		2	2		fourtee						+		
Topic7. Management Decision Making	9		2	2		fourtee					+	+		
Topic8. Modeling of organizational systems by production	9		2	2		fourtee n						+		
Topic9. Modeling organizational systems by the economic activities of the organization	9		2	2		fourtee n				+		+		
The formattestations										one	on	one	E	Z
Totalhours per discipline in semester 9			eig	eig		144								

fifteen

Annex 2 to the work program

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
FEDERAL STATE AUTONOMOUS EDUCATIONAL INSTITUTION OF HIGHER EDUCATION
MOSCOWPOLYTECHNICAL UNIVERSITY (MOSCOW POLYTECH)

Area of study: 38.03.02 Management
EP (educational program): "Business Process Management"
Form of study: full-time, part-time

ATid of professional activity: organizational and managerial, information and analytical

Department: "Management"

FUND EVALUATIONFUNDS

ON DISCIPLINE:

"Modeling Organizational Systems"

Composition: 1. Passport of the fund of appraisal funds 2. Description of appraisal funds:

topics of reports, questions for the exam

Compiled by:

Associate Professor, Ph.D. Korotun O.N.

Moscow 2022

Table 1 - Competence level indicator

Modeling organizational systems					
GEF VO 38.03.02 "Management" EP "Business Process Management"					
In the process of mastering this discipline, the student forms and demonstrates the following competencies:					
COMPETENCES		**Scroll**components	**Technology**competencies formation	**The form**evaluation tool**	**Degrees levels**development of competencies
INDEX	**FORMULATION**				
UK-1	Able to search, critically analyze and synthesize information, apply a systematic approach to solve tasks	**IUK-1.1.**Analyzes the task, highlighting its basic components. **IUK-1.2.**Carries out a search, critically evaluates, generalizes, systematizes and ranks the information required to solve the problem. **IUK-1.3.**Considers and offers rational options for solving the task, using a systematic approach, critically assesses their advantages and disadvantages.	lecture, independent work, seminars	DS, E	**Bbasic**level - methodological bases for defining goals and criteria for achieving goals in the study of systems and system analysis. **elevated**level - able to use the main methods and techniques of system analysis in the study of complex objects.

OPK - 2	Able to collect, process and analyze the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems	**IOPC-2.1.**Knows the methods of collecting, processing and analyzing data necessary to solve the set management tasks, using modern tools and intelligent information and analytical systems. **IOPC-2.2.**Able to collect, process and statistically analyze the data necessary to solve the set management tasks, using modern tools and intelligent information and analytical systems. **IOPC-2.3.**He has the skills to collect, process and analyze the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems.			

**- For abbreviations of the forms of assessment tools, see Annex 3 to the SPM.

Scroll appraisal Withresourcesdiscipline "Modeling of organizational systems"

Annex 3 to the work program

OS nu mb	Name of the evaluation tool	Brief description of the evaluation tool	Presentation of the evaluation tool in the FOS
one			
2	Report, message (DS)	Product Withamostanding work withthatdent, which is a public speech on the presentation of the results of solving a specific educational, practical, educational, research or scientific topic	Topics of reports, messages
3	Exam (E)	The form ocenki hnanuy. AT youWithour educational institutions are held induring the	ATsurveys for the exam

Questionsfor the exam
onddiscipline
"Modeling of organizational systems»formation of the competence of UK-1

one. Radevelopment of systemic ideas in economics and management. Systems methodology as a research theory

2. OWithnew directions in scientific research (elementarism, structural approach).

3. OWithnew directions in scientific research (functional approach, system approach)

four. FROMandWithdark approach and systems analysis and modeling in economics. Principles and postulates of system analysis

5. MonItie "Withsystem". KonWithconstructive aboutscripture Withsocio-economic system

6. FROMandWithdark opiWithanie Withsocio-economic aboutbresearch object.

7. MaThe trinity of system characteristics and the principles of its formation.

eight. ATnewnya and internal environment for the functioning of social economic system

9. Matritsa Withsystemic Xacharacteristic. ATXalone and inoutput parameters

ten. Ughnction and cewhether Radevelopment

Withsystems. MonIpolyfunctionality.

eleven. Pageatthe structure of the system. The concept of polystructurality.

12. FROMandWithdark features. Links and elements of the system. The concept of a subsystem.

13. FROMandWithdark features. System processor. Components of a processor.

fourteen. Etcsystems classification principles. Classification of systems according to the degree of complexity and conditionality of action

fifteen. Etcsystems classification principles. Classification of systems according to the nature of interaction with the external environment.

formation of the competence of OPK-2

16. Zatoony and principles of systemic research. Black box method, possibilities of use.

17. Zatoony and principles of systemic research. Feedback principle. Positive and negativeatelinen arratnye Withtie. Formatla automatic control.

eighteen. Zatoony and principles of systemic research. Feedback principle. The concept of a homeostatic system.

19. Zatoony and principles of systemic research. Feedback principle. Automatic regulation formula.

twenty. Zatothey and principles andssresearch Withsocio-economic systems. Law of Necessary Variety, examples.

21. OWithfeatures Withotsial-economic WithandWithtopics. FROMspecificity of purposeful behavior.

22. OWithfeatures Withotsial-economic WithandWithtopics. FROMspecifics of external dynamics.

23. OWithfeatures Withotsial-economic WithandWithtopics. FROMspecifics of internal dynamics.

24. FROMandWithdark methods of studying the internal environment of socio-economic objects. Matrix of system characteristics.

25. Matrinity of system characteristics. Physical and dynamic measurement of system elements

26. Matrinity of system characteristics. Predictive and control measurement of system elements

27. MorfoloGical method of studying the external environment of the socio-economic system. Basic steps of morphological research

28. System analysis and modeling of the external environment. Stratification of the environment and expert determination of the significance of factors.

29. Analysis of the external environment of the socio-economic system. Methods for identifying key external factors of functioning and development

thirty. Pconstruction and otsenka Withprices Radevelopment exteSchnee Withredy socio-economic system - optimistic, pessimistic and most probable.

31. Memethods for identifying and describing the “problem field” of an

organization using a system classifier

32. System analysis and modeling of the goals of the organization. Methods for the formation of targets. Identification and evaluation of key goals.

33. Medecomposition methods of the organization's goals. Basic requirements and principles for building a "goal tree"

34. Otsenka the current strategy of the organization. Analysis of the possibilities of changing the current strategy, taking into account scenarios for the development of the external environment.

Topicsreports on discipline
"Modeling Organizational Systems"
(fformationcompetencies UK-1)

1. System approach in economics and management.
2. The concept and essence of system analysis and the scope of its application. 3. Principles of system analysis.
4. The concept of a system and its properties.
5. System structure: black box model.
6. Pageatwho uhtoonomic Withsystems and her phoRmalized presentation.
7. Characteristics of the functioning and development of the system. 8. Classification of systems.
9. Patterns of functioning and development of systems: interaction of part and whole.
10. Patterns of hierarchical ordering of systems. 11. Regularities of systems emergence.
12. Patterns of systems development.
13. Patterns of target formation systems.
14. Analytical approach to management: characteristics of the main components.
15. Synthetic approach to management: characteristics of the main components.
16. Synthetic approach to management: management of a simple system. 17. Synthetic approach to management: management of a complex system. 18. Synthetic approach to management: control by parameters.
19. Synthetic approach to management: management by structure. 20. Synthetic approach to management: management by objectives.
21. Synthetic approach to management: management of large systems.
22. Synthetic approach to management: management in the absence of information about the ultimate goal.
23. The sequence of the system analysis.
24. System analysis technology: fixing and diagnosing problems.
25. Tetechnology Withsystemic acash: phoRpeace Ggroups of stakeholders.

(formation of the competence of OPK-2)

26. Technology of system analysis: definition of a problematic mess. 27. Technology of system analysis: definition of a configurator.

28. Technology of system analysis: methods of targeting.
29. Technology of system analysis: formation of criteria.
thirty. Texnology Withsystemic acash: metoda eqWithexperimental study of systems.
31. Technology of system analysis: construction and improvement of the model.
32. System analysis technology: ways to generate alternatives.
33. Methods of choice or decision making in system analysis.
34. TeXnology Withsystemic acash: Realization uluchasing intervention.
35. Comparative characteristics of methods for optimizing management decisions.
36. Method of simple multi-criteria selection: essence and algorithm. 37. Making managerial decisions based on system analysis hierarchies: essence and algorithm.
38. TOPSIS method: essence and algorithm.
39. Tree and decision analysis method: essence and algorithm.
40. Simulation modeling: essence and algorithm.

Report Evaluation Criteria

No.	Criterion	Grade			
		ex.	Xop.	atdol.	unsatisfactory
one	Report Structure	The report contains semantic parts, balanced in volume	The report contains three semantic parts, unbalanced in volume	One of the semantic parts of the report is missing	The report does not trace the presence of semantic parts
2	Content of the report	The content reflects the essence of the problem under consideration and the main results obtained.	The content does not fully reflect the essence of the problem under consideration or the main results obtained.	The content does not fully reflect the essence of the problem under consideration and the main results obtained.	The content does not reflect the essence of the problem under consideration or the main results obtained.
3	Ownership of the material	The student fully owns the material presented, is oriented in the problem, freely answers questions	The student owns the material presented, is oriented in the problem, finds it difficult to answer some questions	The student is not fluent enough in the material presented, poorly oriented in the problem	The student does not own the material presented, poorly oriented in the problem
four	Relevance to the topic	The presented material is fully consistent with the stated topic.	The material presented contains elements that are not relevant to the topic.	The material presented contains a large number of elements that are not related to the topic.	The material presented is slightly relevant to the topic.

Test tasks by discipline

"Modeling Organizational Systems"
Formation of the competence of UK-1

An image or object that can be displayed to characterize a system is:
original
subject
model
the form

System isomorphism is:
situation of maximum efficiency of a single system
the situation of maximum proximity of the simulated system and the original
the situation of maximum accuracy of the model and compliance with its goals
modeling
situation of maximum usability of the model

Partial data on individual elements were collected into aggregated indicators for ease of use when building a model. This corresponds to the modeling approach:
simplification principle
aggregation principle
multiplication principle
synergy principle

As the accuracy of the model increases, the convenience of the model changes as follows:
convenience increases
convenience decreases
convenience does not change
these two parameters of the model are not related in any way

A mathematical model of a process or system that demonstrates a high level of adequacy is distinguished by the following parameters:
the model has a high level of usability
the model has a high degree of detail
the model has a high degree of accuracy
model is highly labor intensive.

A simple model of the functioning of the socio-economic system was built. For each element of the system, descriptions of the tasks performed by it were given. This is typical for the type of simulation:
fully formalized modeling
structural modulation

functional modeling
topological modeling

When the cost growth factor changes by 1%, the sales volume factor changes by 1.2%; in general, their relationship can be expressed as: Y 1.2x + 0.3. This is an example simulation:
fully formalized modeling
partially formalized modeling
analog simulation
topological modeling

The gray box principle in modeling assumes that:
the quantitative parameters of the input and output of the system are known
the quantitative parameters of input and output are known, as well as the functional relationship between the key elements within the system
the quantitative parameters of the input and output and the type of relationship between the elements are known, but there is no quantitative characteristic of the mutual influence of the elements
unknown quantitative input and output parameters of the simulated system

The built profit model of the organization allows you to quickly calculate up to 3 possible sales scenarios and make a decision. We can say that this model meets the criterion ...:
system model accuracy
adequacy of the system model
system model isomorphism
convenience of the system model
system model synergy

When forming a simple tabular model of the system, 4 key parameters were characterized for each object. This is specific to the model type:
object-to-object model
object-subject model
model object-property
subject-property model

The tabular model reflects the following relationship: department 1 - general director; department 2 - sales manager; department 3 - chief accountant. The model used is of the type:
object-to-object model
object-subject model
model object-property
subject-property model

Identification of cause-and-effect relationships when building a system model is typical when applying the general scientific method:
measurements
descriptions
dialectics
formalization

When modeling the external environment, it was concluded that if the volume of the money supply in the future period increases, this will affect the depreciation of the monetary unit. In this case, the general scientific method was applied to determine the trends:
induction
deduction
synthesis
measurements

The value of the organization's sales volume as of 12/31/22 was 7,235 units. To determine this value, a general scientific method was used:
induction
deduction
measurements
descriptions

The general scientific method of description is the basis for analysis and model building. What the description includes:
measurement results of the main elements of the system
measurement results, structure, hierarchy and interaction of elements
measurement results, control and feedback of elements in the system
measurement results, hierarchical structure of system elements
To build an extrapolation forecast model, a numerical series of dynamics was formed based on retrospective information on the development of the process for 2018-2020. What general scientific method is needed to build it: (
dialectics
induction
statistical method
heuristic method

During the strategic foresight session, a working team was formed from industry representatives who assessed future trends in the scientific and technical field using a point-rating system. This approach is typical for the category of general scientific methods:
statistical methods
heuristic methods
dialectical methods
formal-logical methods

Indicator: price for 1 unit of production. Status: 34% increase over the previous 4 months. Further growth is possible, as prices from competitors are also increasing. The nature of the impact on the organization is a significant drop in demand in the coming months. What general scientific methods were used for this characterization of the environment?
Measurement, description, induction
Measurement, description, deduction
Description, synthesis, measurement
Deduction, formal logical method, extrapolation

The essence of the correlation-regression analysis is:
continuation of the identified process trends into the future
determination of the strength of the functional relationship between the elements of a system or process
characterization of options by formal features for each parameter of the system
calculation of output value and output of the simulated system

The Y 3 + 1.2X + 0.4 type model is an example of a model:
linear regression model
structural functional model
hierarchical model
neural network model

In models built by the autoregressive method, the future (modeled) values of the process are substantiated:
functional dependence of external factors
retrospective series of statistical information
macroeconomic factors
weights of individual factors

A numerical series of dynamics is given: 12 14 17 19 23 25. What will be the value of the moving average if the interval size is 3 units:
14 16 20 22
12 15 19 23
11 19 20 23
14 18 20 24

Models built by the autoregression method are not suitable for generating results for the following processes:
smoothly changing processes
processes with high variability
demographic processes
processes by which numerical series of long duration are collected

What determines the activation of a neuron in neural network models of processes?:
on the number of output signals

from a rigidly defined functional relationship between the input and output of a neuron
from external factors of a higher level
on the content and weight of input signals

In a neural network model built on the basis of Markov chains, the probability of a process transition from state H1 to state H2 is estimated at 0.23, the probability of transition from state H1 to state H3 is estimated at 0.4. What will be the next exact one in the process chain?:
H1
H2
H3
The process is non-equilibrium and has a high variability

The following restrictions are introduced at the first level of the hierarchical tree of the CART model. If the value of X is greater than the constant, the scenario of the second level 2.1 is implemented. If the value of X is less than the constant, the scenario of the second level 2.2 is implemented. At the starting point of this process, X was 3.7, the value of the constant Z was 4. Which scenario was chosen in the model?:
scenario 2.1.
scenario 2.2.
both scenarios will be implemented since this is an "AND" tree
Scenario 2.1 will be selected at the first level, 2.2 at the second

Formation of the competence of the OPK-2

The average value between the actual and simulated (calculated) indicators for each point of the numerical series of dynamics is:
average relative error
mean absolute error
root mean square error
dispersion

In the mathematical model, a trend of change in the studied indicator was derived based on a significant amount of retrospective data. So, for a forecast for 1 time point (month), we used data from at least 36 time points in the retrospective period. This model can be recognized
systemic
credible
accurate
verified

The accuracy of a process or system model is determined by:
degree of predictive ability
length of forecast periods
the degree of scatter of the modeled indicators,
speed of obtaining simulation results

The calculated value for 2020 was - 12,400 units, the actual value of the indicator was fixed - 14,000 units. What will be the size of the average absolute error on this date:
1300
1400
1500
1600

The estimated value of the sales volume for 2020 was 750 units, the actual value of the indicator was fixed at 635 units. What will be the accuracy of the result of this model when calculating the average relative error?:
model accuracy is high
model accuracy is good
model accuracy is satisfactory
model accuracy is unsatisfactory
Trend extrapolation as a process is:
Identification of the strength of connections between the elements of the system
Extension of an existing trend into the future based on simulations
Qualimetric assessment of trends in the model
Formation of a roadmap for the future process

The main purpose of extrapolation models is:
Modeling the input and output process
Finding the optimal solution among the set of solutions
Prediction of the future state of a system or process
Allocation of resources between process operations

When forming a mathematical model of a process or system, a method for implementing the model based on the least squares method was chosen. This action was performed at the stage of extrapolation model formation:
Stage 1. Formation of the boundaries of the mathematical model.
Stage 2. Determining the technology for creating a model.
Stage 3. Formation of the parametric characteristics of the system.
Stage 4. Setting model constraints.

The formation of the parametric characteristics of the system in modeling implies:
Formation of subjects and objects of the simulated system
Quantitative characteristics of all the main elements of the system, determination of their hierarchy
Characteristics of the controlled elements of the system
Characteristics of the objective function

The characteristic of controlled and uncontrolled variables in the formation of an extrapolation model is carried out at the following stage:
Stage 1. Formation of the boundaries of the mathematical model.
Stage 2. Determining the technology for creating a model.
Stage 3. Formation of the parametric characteristics of the system.

Stage 4. Setting model constraints.

To create an extrapolation model, the following numerical series of dynamics was formed: 2016 - 31,270, 2017 - no data, 2018 - 32,460, 2019 - no data, 2020 - no data, 2021 - 33,560, 2022 - 35,230. series adequate for the formation of a predictive model for 2 years by extrapolation method?:
The number line fits perfectly.
The number row is not enough
No criteria for evaluating the number series
A typical mathematical function of type y ax + b is characterized by the following process:
Process with variable acceleration
Process with uniform linear development
slow process
Accelerating Process

In the analytical table of the extrapolation model of the process, there are the following structural components:
The left side includes the forecast base, the right side includes analytical transformations
The left side includes forecast results, the right side includes analytical transformations
The left side includes the forecast base, the right side includes the list of process subjects
The left side includes a list of the main work of the process, the right side a list of those responsible for the result of the execution

A significant difference between the actual and calculated data in the analytical table of the extrapolation model indicates:
This is a feature of using extrapolation models
The model is imprecise (inadequate)
It's a kind of norm
The model cannot be fully used.

In the projected extrapolation model, the result of the process is affected by 4 factors of the internal and external environment, as well as the time factor t. What category does this model belong to?
Simple extrapolation model
Complex extrapolation model
Complex extrapolation model
Adequate extrapolation model

When building the model, the following numerical series of dynamics was formed: 23 25 27 31 32 35 38. What will be the growth rate of the indicator for this series?
59
65
68

74

The smoothing interval in the extrapolation model built using the moving average method is:
The set of growth rates of the numerical series of dynamics
The average value of the numerical series of dynamics
The number of points in the period in which the average value was calculated
The set of average levels of a series of dynamics

The model has the following numerical series of dynamics: 43.2 49.7 55.3 58.2 65.4 69.1. If the value of 69.1 is the value of t preceding the predicted one, then what will the value of yt-1 be for this series?:
58.2
43.2
65.4
49.7

The basis for the model by the moving average method is a retrospective numerical series of dynamics: 123 128 137 144 156 178. What will be the value of the moving average for the first 3 points of the smoothed (calculated) numerical series Yr?:
119.126
118.125
129.136
137.140

Actual numerical series of dynamics in the model used: 123 128 137 144 156 178, smoothed numerical series (moving average) 129 136 145 159. Determine the predictive value using the model using the moving average method:
159.14
163.78
165.5
162.7

The following process values for the previous period were obtained: 2018 - 3,970; 2019 - 4,100; 2020 - 4,378;
238
278
298
310

On the basis of retrospective information, the following numerical series of dynamics was formed: 378,395,410,437,455. How will the smoothed (calculated) time series of dynamics based on the moving average method look like?:
399, 421, 440
385, 400, 414
394, 414, 434
378, 412, 427

The typical size of the smoothing interval when building an extrapolation model using the moving average method is:
the whole number series of dynamics
3.5 or 7 points
7, 10, 12 points
the bigger, the better

The expression mt-1 is used to determine the forecast value in the extrapolation model using the moving average method. This expression means:
number of levels included in the smoothing interval
the actual value of the studied indicator for the previous period
moving average for two periods before the forecast
the actual value of the phenomenon under study for two periods preceding the forecast

An extrapolation model using the moving average method allows you to adequately represent the future value of the process:
10 or more time points
for 3-4 time points
for 7-8 time points
for 1-2 time points (for example, a month)

The peculiarity of the extrapolation model by the method of exponential smoothing is that:
different periods of a numerical (time) series have different importance (weight)
it uses the exponential curve equation
it uses the correlation-regression equations
it calculates the weighted average over the entire number series

In the exponential smoothing model, when the value of the coefficient of importance a is close to 1, the greatest weight is given to the following data:
the earliest data in the numerical series of dynamics
all data in the numerical series of dynamics
the latest data in the numerical series of dynamics
specific unit of data

If it is not possible to set the exact value of the smoothing interval a in the exponential smoothing model, then it is determined:
based on a constant

based on process benchmark
based on the length of the time series
based on regression coefficient

The exponentially weighted average of the beginning of the period is determined based on the following method:
arithmetic mean over the entire number series or the first value of the number series
mean modal over the entire number series or the last value of the number series
strictly the first value of the number series
the value is taken based on the constant

The base of the model is a numerical series of dynamics of 12 units (time points). What will be the size of the smoothing parameter a for this series?:
0.1
0.15
0.25
0.35

To build a mathematical model using the exponential smoothing method, a numerical series of dynamics of 9 units was formed. Determine, based on the calculation of the smoothing parameter, how the data weight will be distributed in the number series:
the late data of the number series will have the greatest weight
the very first data of the number series will have the greatest weight
the weight will be distributed over most of the number series
all will have the first value of the numerical series of dynamics

To build the model, the following numerical series was formed: 28 31 45 57 64 78. The size of the exponentially weighted average, determined by the first method, in this case will be:
40.5
45.5
50.5
65.5

The exponentially weighted average for 2020 is: U2020 712.7 * 0.3 + (1 - 0.3) * 240.4 213.81 + 168.28 382.09. The actual value for 2021 was 820.3. What will be the value of the exponentially weighted average for 2021?:
489.4
501.3
513.6
528.6

There are the following actual values of the numerical time series: 375 398 412 455. The size of the smoothing parameter in the model is 0.45. Determine the predictive value of the process based on the exponential smoothing model if the last actual value was 455:

398.17
400.5
437.53
498.3

The basis for building an extrapolation model using the least squares method is:
Calculation of the standard deviation of the predicted indicator
Calculation of the exponentially smoothed value of the numerical series of dynamics
Definition of regression coefficients
Calculation of the weights of the values of the numerical series of dynamics

To display the process change trends, the following expression yt+1 1.2 + blg0.3 was formed. What type of process is being simulated?
Linear development
Exponential Development
Growth retardation development
Development with variable acceleration

Name a typical application of least squares models:
Smoothly changing processes
Processes with a voluminous numerical series of retrospective information
Processes with a high degree of variability
Processes with a seasonality factor

The regression coefficients in the least squares model characterize:
the duration of the numerical series of dynamics
the size of the smoothing interval in the model
weighted average value by units of the numerical series of dynamics
functional relationship between the time factor X and the result of the process Y