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MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Autonomous Educational Institution of Higher Education

"Moscow Polytechnic University"

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"27" февраля 2025

Dean of the Faculty
of Economics and Management
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"27" февраля 2025

WORKING PROGRAM OF THE DISCIPLINE

"Modeling of Organizational Systems"

Field of study
38.03.02 Management

Educational program (profile)
"Business Process Management"

Qualification (degree)
Bachelor

Form of study
Part-time

Moscow 2025

Developer(s):

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1. Goals, objectives and planned learning outcomes in the discipline.

Primary goal: mastering the discipline "Modeling of Organizational Systems" - consideration of the theoretical foundations and patterns of construction and operation of systems, including economic, methodological principles of their analysis and synthesis, application of the studied patterns to develop systematic approaches to decision making.

The main objectives 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, environmental influences, capabilities and basic approaches to using system analysis at the organizational level;
- Students' acquisition of theoretical knowledge on a systems approach to the study of systems and practical skills in their modeling;
- Students' acquisition of practical knowledge on basic methods used in systems analysis.

A list of planned learning outcomes for the discipline (module), correlated with the planned results of mastering the professional training program.

As a result of mastering the discipline, students develop the following competence and the following learning outcomes must be achieved as a stage in the formation of the corresponding competence:

Competency code	**As a result of mastering the educational program the student must possess**	**List of planned learning outcomes in the discipline**
UK-1	Is capable of searching, critical analysis and synthesis of information, apply a systematic approach to solve assigned problems	**IUK-1.1.**Analyzes the task, highlighting its basic components. **IUK-1.2.**Searches, critically evaluates, summarizes, systematizes and ranks information required to solve a given problem. **IUK-1.3.**Considers and offers rational options of solving the assigned task, using a systematic approach, critically evaluates their advantages and disadvantages.
OPK - 2	Is capable of collecting, processing and analyzing data required for solving assigned management tasks using modern tools and intelligent information analytical systems	**IOPK-2.1.** Knows methods of collecting, processing and analyzing data necessary to solve assigned management tasks, using modern tools and intellectual information-analytical systems. **IOPK-2.2.** Is able to collect, process and statistically analyze data necessary to solve assigned management tasks using modern tools and intellectual information and analytical systems. **IOPK-2.3.** Possesses the skills of collecting, processing and analyzing data necessary to solve assigned management tasks, with using modern tools and intelligent information and analytical systems.

2. Place of discipline in the structure of the educational program

Discipline "Modeling organizational systems" applies to the section of elective disciplines No.

2 parts (B1.DV.2) of the undergraduate educational program. Discipline "Modeling organizational systems" interconnected logically and content-methodically with the following disciplines and practices of the EP:

- Organizational change management;
- Management of subject-object relationships in business processes;
- Business process reengineering;
- Systematic management of business processes.

3. Structure and content of the discipline.

The total labor intensity of the discipline is _Five_ credit(s) units (180 hours).

3.1. Types of educational work and labor intensity

(According to forms of study)

3.1.1. Part-time education

No. p/p	Type of educational work	Quantity hours	Semesters 9	-
1	**Auditory lessons**	**36**	**36**	-
	Including:			-
1.1	Lectures	18	18	-
1.2	Seminars/practical sessions	18	18	-
1.3	Laboratory exercises	-	-	-
2	**Independent work**	**108**	**108**	-
3	**Interim certification**	**-**	**-**	-
	Test/differential test/exam	Exam	Exam	-
	Total	**144**	**144**	

3.2. Thematic plan for studying the discipline

(According to forms of study)

3.2.1. Part-time education

No.	Sections/topics of the discipline	Labor intensity, hour					
		Total	Classroom work				Independently that's the job
			Lecture	Seminars/practical sessions	Laboratory exercises	Practical training	
1	Topic 1. Introduction to the discipline. Basic definitions. Concepts, characterizing systems	16	2	2			12
2	Topic 2. Systems approach and its basic principles	16	2	2	-	-	12
3	Subject 3. Models And methods system analysis	16	2	2	-	-	12
4	Subject 4. Specific models system analysis	16	2	2	-	-	12

5	Topic 5. Analysis and formation system goals	16	2	2	-	-	12
6	Topic 6. Basics of acceptance theory solutions	16	2	2	-	-	12
7	Topic7. Adoption solutions By management	16	2	2	-	-	12
8	Subject 8. Modeling Organizational production systems	16	2	2	-	-	12
9	Subject 9. Modeling of organizational systems economic activities of the organization	16	2	2	-	-	12
	Total	144	18	18			108

3.3. Contents of the discipline

Topic 1. Introduction to the discipline. Basic definitions. Concepts characterizing systems.

Introduction to the discipline. Basic definitions: system, system element, connection, subsystem, goal, structure, types of structures, control system, cybernetic system, system analysis, systems approach. Concepts characterizing systems: state, equilibrium, development, stability. Classification of systems: the purpose of any classification, according to interaction with the environment, base classifications, Name classes of systems, distinctive features of classes, examples of classes.

Fundamentals of systems theory: the system and its components, forms of representation, purpose of operation. 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 basic principles.

System approach and its basic principles. Fundamentals of the systems approach: systems approach, system objects, direct connection, feedback, positive feedback, negative feedback, feedback coefficient. Principles of the systems approach: the principle of integrity, the principle of compatibility of elements in the system, the principle of organization, the principle of purposefulness and expediency.

The principle of neutralization of dysfunctions, the principle of labilization of functions, the principle of adaptability, the principle of evolution, the principle of isomorphism, the principle of poly-functionality of a complex system, the principle of an integrated approach, the principle of expediency, the principle of "complete system". 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.

Scheme of system analysis procedures. Principles of systems analysis. Panorama of systems analysis methods. Selecting modeling methods. Methods of formalized representation of systems. Direct resource allocation problem based on linear programming.

Topic 3. Models and methods of system analysis.

Models and methods of system analysis. Model as the main means of studying systems: Fine structured problems, unstructured problems, weak structured problems, model, simulationeconomic systems, problem experiment, meaningful production tasks, stages practical modeling, classification mathematical models, analytical mathematical models, algorithmic mathematical models.

Methods of formal representation of systems: analytical, statistical, and graphical. Information approach to systems analysis: information, input information, output information, internal, intra-system, amount of information.

Features of the application of the dual LP problem for the analysis of the economic system. Variants of transport tasks (TT). Criteria for choosing a target and optimal transport flows. Sequence of solving a transport problem based on the cost criterion.

Topic 4. Specific models of system analysis.

Specific models of system analysis. IDEF family standards. Types of IDEF standards: functional block, dominance, interface arc, branching arcs. IDEF0 methodology: merging arcs, 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 functions, constructing a diagram, decomposition and refinement, evaluating the model. IDEF3 methodology: purpose of IDEF3, types of diagrams in IDEF3, classification of types of intersections, basic principles of ontological analysis, IDEF5 concepts, types of IDEF5 diagrams and diagrams. Organization and evaluation of complex examinations: Concordance, Spearman, and confusion coefficients. Methods for conducting expert procedures. Calculation of weighting coefficients of criteria.

Topic 5. Analysis and formation of system goals.

Analysis and formation of system goals. Purpose and its characteristics. Goal analysis. Synthesis of goals (goal setting). Solving the problem of optimizing an organization's production plan. Modeling the functioning of an organization when resources and structure change.

Topic 6. Fundamentals of decision theory.

Making decisions based on many criteria. Experts. Group organization methods examination System analysis and modeling in strategic planning and management. Solving the problem of choosing a strategy taking into account synergies, effects and costs. Particular problems of system analysis.

Topic7. Management decision making.

General characteristics of the operational management of the main production and the complex of tasks of the subsystem. Characteristics of tasks of operational scheduling of main production. System dynamics. Concept of analysis of resource flows by dynamic equations. Dynamics of development of business organizations.

Topic 8. Modeling of organizational systems by production.

Modeling of organizational systems. Management concept. Principles of management theory. Control functions. Solving typical problems for calculating the probabilities of system states, calculating technological and economic efficiency.

Topic 9. Modeling of organizational systems by the economic activities of an organization.

Indicators of efficiency of economic activity. Analysis and assessment of organizational management structures. Indicators of efficiency of economic activity. Modeling of organizational systems by the investment activities of the organization.

3.4. Topics of seminars/practical and laboratory classes

3.4.1. Seminars / Practical classes.

Topic 1.*Introduction to the discipline. Basic definitions. Concepts characterizing systems.*	Questions for Lecture 2	Test tasks 1-5
Topic 2.*System approach and its basic principles.*	Questions for lecture 3	Test tasks 6-9
Topic 3.*Models and methods of system analysis.*	Questions for lectures 4	Test tasks 14-20

Topic 4.*Specific models of system analysis.*	Practical lesson 1	Test tasks 10-13
Topic 5.*Analysis and formation of system goals.*	Practical lesson 2	Test tasks 21-30
Topic 6.*Fundamentals of decision theory.*	Practical lesson 3	Test tasks 6-9
Topic 7.*Management decision making.*	Practical lesson 4	Test tasks 12-19
Subject 8. *Modeling organizational systems production.*	Practical lesson 5	Test tasks 22-30
Subject 8. *Modeling organizational systems economic activities of the organization.*	Practical lesson 6	Test tasks 30-35

4. Educational, methodological and information support

4.1. Main literature:

1. Modeling of processes and systems: textbook and workshop for universities / E. V. Stelmashonok, V. L. Stelmashonok, L. A. Enikeeva, S. A. Sokolovskaya; edited by E. V. Stelmashonok. - M.: Yurayt Publishing House, 2023. - 289 p. - (Higher education). — ISBN 978-5-534-04653-3. — Text: electronic // Educational Uright platform [website]. — URL: https://urait.ru/bcode/511904
2. Prokofieva T. A. System analysis and modeling in management: 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

4.2. Additional literature:

1. Zagranovskaya A.V. System analysis and modeling: 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
2. Kozhevnikova I. A. Stochastic modeling of processes: textbook for universities / I. A. Kozhevnikova, I. G. Zhurbenko. — 2nd ed., revised. and additional - M.: Yurayt Publishing House, 2023. - 148 p. - (Higher education). — ISBN 978-5-534-09989-8. — Text: electronic // Educational platform Urayt [website]. — URL:https://urait.ru/bcode/515176.

4.3 Electronic educational resources:

1. An electronic educational resource on the discipline is under development.

5. Material and technical support of discipline.

Auditorium for lectures and seminars of the general fund. Study tables with benches, a blackboard, a portable multimedia complex (projector, projection screen, and laptop). Teacher's workplace: table, chair.

6. Guidelines

6.1. Methodological recommendations for teachers on organizing training.

Current control (carried out by the lecturer and teacher): correctness of answers to questions on the topics covered; assessment of existing opinions and approaches to solving specific problems; essay preparation; intermediate testing in individual sections of the discipline.

When performing routine monitoring, it is possible to use test material. Samples of control questions and tasks for conducting ongoing monitoring are given in the appendix. When implementing a bachelor's degree program, an organization has the right to use e learning and distance learning technologies. All materials are posted in the Moscow Polytechnic Library.

When training people with disabilities, e-learning and distance educational technologies must

provide for the possibility of receiving and transmitting information in forms accessible to them.

6.2. Guidelines for students on mastering the discipline.

A lecture is a systematic, consistent, monologue presentation by a teacher of educational material, usually of a theoretical nature. When preparing a lecture, the teacher is guided by the work program of the discipline. During lectures, it is recommended to take notes, which will allow you to later recall the studied educational material and supplement the content when working independently 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 margins in your working notes in which to make notes from the recommended literature, supplementing the material of the lecture you listened to, as well as emphasizing the special importance of certain theoretical positions. Conclusions from the lecture summarize the teacher's thoughts on educational issues. The teacher provides a list of used and recommended sources for studying a specific topic. At the end of the lecture, students have the opportunity to ask questions to the teacher about the topic of the lecture. When delivering lectures on the discipline, electronic multimedia presentations can be used.

Methodological instructions for students when working at the seminar.

Seminars are implemented in accordance with the working curriculum with sequential study of the topics of the discipline. In preparation for the seminars, the student is recommended to study the basic literature, familiarize himself with additional literature, new publications in periodicals: magazines, newspapers, etc. In this case, you should take into account the recommendations of the teacher and the requirements of the curriculum. It is also recommended to finalize your lecture notes by making appropriate notes from the literature recommended by the teacher and provided for by the curriculum. Abstracts should be prepared for presentations on all educational issues brought up for the seminar.

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

Guidelines for students on organizing independent 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. When working independently, the student interacts with the recommended materials with the participation of the teacher in the form of consultations. 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.

If there are students with disabilities, they will be provided with printed and (or) electronic educational resources in forms adapted to their health limitations.

Guidelines for making presentations.

A presentation (from the English word - presentation) is a set of color pictures-slides 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, which are designed for a certain category of viewers (users).

Multimedia computer presentation is:

- dynamic synthesis of text, image, sound;
- the most modern software interface technologies;
- interactive contact between the speaker and the demonstration material;
- mobility and compactness of information media and equipment;
- ability to update, supplement and adapt information;
- low cost.

Rules for designing computer presentations General
design rules

Many designers claim that there are no laws or rules in design. There are tips, tricks, and techniques. Design, like any kind of creativity, art, like any way of some people communicating with others, like a

language, like a thought, will bypass any rules and laws.

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

Font design rules:

- Serif fonts are easier to read than sans serif fonts;
- It is not recommended to use uppercase letters 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 received by the audience and not cause negative emotions (subconscious or fully conscious), it is necessary to follow the rules of its design.

A presentation involves a combination of information of various types: text, graphics, music and sound effects, animation and video clips. Therefore, it is necessary to take into account the specifics of combining pieces of information of different types. In addition, the design and display of each of the listed types of information is also subject to certain rules. Therefore, for example, the choice of font is important for textual information, brightness and color saturation are important for graphic information, and optimal relative position on the slide is necessary for the best possible perception of them together.

Let us consider recommendations for the design and presentation of various types of materials on the screen.

Formatting text information:

- Font size: 24–54 points (heading), 18–36 points (plain text);
- The font color and the background color should contrast (the text should be easy to read), but not hurt the eyes;
- Font type: for the main text a smooth sans-serif font (Arial, Tahoma, Verdana), for the title you can use a decorative font if it is easy to read;
- Italics, underlining, bold font, and capital letters are recommended to be used only for semantic highlighting of a text fragment.

Design of graphic information:

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

Contents and arrangement of information blocks on the slide:

- There should not be too many information blocks (3-6);
- The recommended size of one information block is no more than 1/2 the size of the slide;
- It is desirable to have blocks with different types of information on the page (text, graphs, diagrams, tables, pictures) that complement each other;
- Key words in the information block must be highlighted;
- It is better to place information blocks horizontally; blocks that are related in meaning — from left to right;
- The most important information should be placed in the center of the slide;
- The logic of presenting information on slides and in a presentation must correspond to the logic of its presentation.

In addition to the correct arrangement of text blocks, we must not forget about their content - the

text. Under no circumstances should it contain spelling errors. You should also take into account the general rules of text formatting.

After creating a presentation and its design, you need to rehearse its presentation and your speech, check how the presentation as a whole will look (on a computer screen or projection screen), how quickly and adequately it is perceived from different places in the audience, under different lighting, noise, in an environment as close as possible to real performance conditions.

7. Appraisal Fund

7.1. Methods for monitoring and assessing learning outcomes

In the process of mastering this discipline, the student forms and demonstrates the following: **competencies**:

COMPETENCIES		List of components	Technology and formiro	Evaluation form	Degrees of levels of mastering competencies
INDE-KS	**FORMULATED CA**				
UK-1	Is able to search critical analysis and synthesis of information, apply a systematic approach to solve assigned problems	**IUK-1.1.** Analyzes task, highlighting its basic components. **IUK-1.2.** Implements search, critically evaluates, summarizes, systematizes and ranks the information required to solve the problem. **IUK-1.3.**Considers and offers rational options for solving a given problem, using a systematic approach, critically evaluates their advantages and disadvantages.	lecture, independent work, seminar classes	DS, E	**A basic level:** - Methodological foundations for determining goals and criteria for achieving goals in systems research and system analysis. **Increased level:** knows how to use basic methods and techniques of system analysis in the study of complex objects.
OPK - 2	Is able to collect, process and analyze data necessary for decision-making delivered management tasks, using modern tools and intelligent information and analytical systems	**IOPK-2.1.** Knows methods of collecting, processing and analyzing data necessary to solve assigned management tasks, using modern tools and intelligent information and analytical systems. **IOPK-2.2.** Is able to collect, process and statistically analyze data necessary to solve assigned management tasks, using modern tools and intelligent information and analytical systems. **IOPK-2.3.** Possesses skills in collecting, processing and analyzing data necessary to solve assigned management tasks, using modern tools and intelligent information and analytical systems.	lecture, independent work, seminar classes	DS, E	**A basic level:** - Methodological foundations for determining goals and criteria for achieving goals in systems research and system analysis. **Elevated level:** knows how to use main methods and techniques of systematic analysis at exploringcomplex objects.

7.2. Scale and criteria for assessing learning outcomes

In the process of mastering the educational program, competencies, including their individual components, are formed gradually as students master disciplines (modules) and practices in accordance with the curriculum and calendar schedule of the educational

process.

An indicator for assessing competencies at various stages of their formation is the achievement by students of the planned learning outcomes in the discipline (module).

UK-1 Capable realize search, critical analysis And synthesis of information, apply a systematic approach to solve assigned problems				
Index	**Evaluation criteria**			
	2	**3**	**4**	**5**
IAA-1.1. Analyzes the task, highlighting its basic components.	The student demonstrates complete absence or insufficient compliance with the following knowledge: analyzes the task, highlighting its basic components.	The student demonstrates incomplete compliance with 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.	Student demonstrates full compliance with the following knowledge: analyzes the task, highlighting its basic components. Fluently operates with acquired knowledge.
IUC-1.2. Implements search, critically evaluate, summarize, systematize and rank information, required for solution of the assigned task.	The student is unable or insufficiently able to search, critically evaluate, summarize, systematize and rank information, required for solution of the assigned task.	The student demonstrates incomplete compliance the following skills: search, critically evaluate, summarize, systematize and rank information, required for solution of the assigned task.	The student demonstrates partial compliance the following skills: search, critically evaluate, summarize, systematize and rank information, required for solution of the assigned task.	The student demonstrates full compliance with the following skills: implement search, critically evaluate, summarize, systematize and rank information, required for solution of the assigned task.

IUC-1.3. Considers and offers rational options for solving the problem, using a systematic approach, critically evaluates them advantages and disadvantages.	The student does not possess or possesses insufficient knowledge of consideration and proposal rational options for solving the problem, using a systematic approach, critically evaluating them advantages and disadvantages .	The student partially possesses the consideration and proposal of rational options for solving the problem, using a systematic approach, critically evaluating their advantages and disadvantages. The learner experiences significant difficulties in applying skills in new situations.	The student possesses consideration and proposal rational options for solving the problem, using a systematic approach, critically evaluating their advantages and disadvantages, but minor mistakes, inaccuracies, difficulties in analytical operations, transferring skills to new, non-standard situations.	The student possesses full control over the consideration and offering rational options for solving the problem, using a systematic approach, critically evaluating their advantages and disadvantages, freely applies acquired skills in situations of increased complexity.
PC-7- Is able to form possible solutions based on target indicators developed for them, as well as carry out analysis, justification and selection of solutions				
Index	**Evaluation criteria**			
	2	**3**	**4**	**5**
IOPK-2.1. Knows collection methods, data processing and analysis, necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems.	The student demonstrates complete absence or insufficient compliance the following knowledge: the methods of collecting, processing and analyzing the data necessary for solving the assigned management tasks, using modern tools and intelligent information and analytical systems. .	The student demonstrates incomplete compliance of the following knowledge: the methods of collecting, processing and analyzing the data necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems Significant mistakes, insufficient knowledge is manifested, according to a number of indicators, the student experiences significant difficulties in operating knowledge when transferring them to new situations.	The student demonstrates partial compliance the following knowledge: the methods of collecting, processing and analyzing the data, necessary for solving the assigned management tasks, using modern tools and intelligent information and analytical systems, but minor mistakes, inaccuracies, and difficulties in analytical operations.	The student demonstrates full compliance the following knowledge: the methods of collecting, processing and analyzing the data necessary for solving the assigned management tasks, using modern tools and intelligent information-analytical systems. Fluently operates with acquired knowledge.

IOPK-2.2. Can implement collecting, processing and statistical analysis of the data necessary for solving the assigned management tasks, using modern tools and intelligent information and analytical systems.	The student does not know how or is insufficiently able to collect, process and statistically analyze the data necessary for solving assigned management tasks, using modern tools and intelligent information and analytical systems.	The student demonstrates incomplete compliance with the following skills: collect, process and statistically analyze the data necessary for solving the assigned management problems using modern tools and intelligent information and analytical systems. Significant mistakes are made; insufficient knowledge is manifested in operating knowledge when transferring it to new situations.	The student demonstrates partial compliance with the following skills: collect, process and statistically analyze the data necessary for solving the assigned management tasks, using modern tools and intelligent information and analytical systems but minor mistakes and inaccuracies occur	The student demonstrates full compliance with the following skills: collect, process and statistically analyze the data necessary for solving the assigned management tasks, using modern tools and intelligent information and analytical systems. Operates freely with acquired knowledge
IOPK-2.3. Possesses the skills of collecting, processing and analyzing data, necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems.	The student can not or does not have sufficient skills in collecting, processing and analyzing the data necessary for solving the assigned management tasks, using modern tools and intelligent information and analytical systems.	The student partially possesses the skills of collecting, processing and analyzing data, necessary to solve the assigned management tasks, using modern tools and intelligent information and analytical systems. The student experiences significant difficulty applying skills in new situations.	The student 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, but minor mistakes, inaccuracies, and difficulties in analytical operations, transferring skills to new, non-standard situations.	Trained in full skills of collection, processing and analyzing the data required for solving the assigned management tasks, using modern tools and intelligent information analytical systems. Freely applies acquired skills in situations of increased complexity.

Scales for assessing the results of intermediate certification and their description:

Form of intermediate certification: exam.

Interim certification of students in the form of an exam is carried out based on the results of completing all types of academic work provided for by the curriculum for a given discipline (module), while taking into account the results of ongoing monitoring of progress

during the semester. Assessment of the degree to which students have achieved the planned learning outcomes in the discipline (module) is carried out by the teacher leading classes in the discipline (module) using the method of expert assessment. Based on the results of the intermediate certification for the discipline (module), a grade is given: “excellent”, “good”, “satisfactory” or "unsatisfactory".

Only students who have completed independent work are allowed to take the intermediate assessment.

Grading scale	*Description*
Excellent	*Completed independent work, passed test tasks, actively participated in a business game, and performed other types of work provided for by the curriculum. The student demonstrates compliance with the knowledge, skills and abilities given in the tables of indicators, operates with the acquired knowledge, skills, abilities, and applies them in the situations of increased complexity. In this case, minor mistakes, inaccuracies, and difficulties during analytical operations and the transfer of knowledge and skills to new, non-standard situations may be made.*
Good	*Completed independent work, passed test tasks, actively participated in a business game, and performed other types of work provided for by the curriculum. The student demonstrates incomplete, correct compliance of knowledge, skills and abilities with those given in the tables of indicators, or if 2-3 insignificant mistakes were made.*
Satisfactory	*Completed independent work, passed test tasks, participated in a business game, and performed other types of work provided for by the curriculum. The student demonstrates the consistency of knowledge, which covers the main, most important part of the material, but at the same time one significant mistake or inaccuracy was made.*
Unsatisfactory	*Completed independent work in the form of a scientific report, did not fully participate in classroom work provided for by the curriculum. The student demonstrates incomplete compliance of knowledge, abilities, skills with those given in the tables of indicators, significant mistakes are made, a lack of knowledge, abilities, skills is manifested in a number of indicators, the student experiences significant difficulties in operating knowledge and skills.*

7.3. Discipline evaluation tools "Sales and customer relationship management"

ET No.	Name of the evaluation tools	Brief description of the evaluation tool	Submission of the evaluation tool in FOS
1	Test (T)	A system of standardized tasks that allows automate procedure for measuring the level of knowledge and skills of the student.	Fund test tasks
2	Report, presentation (RP)	The product of the student's independent work, which is a public performance by presentation of the obtained results of solving a certain educational and practical task, educational research or scientific topic	Topics of reports, presentations
3	Exam (E)	The form of knowledge evaluation tool. In higher education institutions, they are held during the examination session.	Questions for the exam

7.3.1. Current control

Topics of reports on the discipline "Modeling of organizational systems" (Formation of competence UK-1)

1. Systematic approach in economics and management.
2. The concept and essence of system analysis and its areas of application.
3. Principles of systems analysis.
4. The concept of a system and its properties.
5. System structure: black box model.
6. Structure economic systems and her formalized 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. Regularities of hierarchical ordering of systems.
11. Patterns of emergence of systems.
12. Patterns of systems development.
13. Regularities of target formation of systems.
14. Analytical an approach management: characteristicmain components.
15. Synthetic an approach management: characteristic main components.
16. Synthetic approach to control: control of a simple system.
17. Synthetic approach to management: managing a complex system.
18. Synthetic approach to management: management by parameters.
19. Synthetic approach to management: management by structure.
20. Synthetic approach to management: management by objectives.

21. Synthetic an approach management: control large systems.
22. Synthetic an approach management: control at absence of information about the final goal.
23. Sequence of system analysis.
24. System analysis technology: fixing and diagnosing problems.
25. Technology systemic analysis: formation stakeholder groups.

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26. Systems analysis technology: identifying the problem mess.

27. System analysis technology: definition of a configurator.
28. System analysis technology: target identification methods.
29. Technology of system analysis: formation of criteria.
30. Technology systemic analysis: methods experimental systems research.
31. Technology systemic analysis: construction and improvement of the model.
32. System analysis technology: ways to generate alternatives.
33. Methods of selection or decision-making in system analysis.
34. Technology systemic analysis: implementation improving intervention.
35. Comparative characteristic methods optimization management decisions.
36. Method of simple multi-criteria selection: essence and algorithm.
37. Making management decisions based on a systemic analysis of hierarchies: essence and algorithm.
37. TOPSIS method: essence and algorithm.
38. Method of tree and decision analysis: essence and algorithm.
39. Simulation modeling: essence and algorithm.

Report evaluation criteria

No.	Criterion	Grade			
		Excellent	Good	Satisfactory	Unsatisfactory
1	Report Structure	The report contains semantic parts, balanced by volume	The report contains three semantic parts, unbalanced by volume	One of the semantic parts in the report is absent	The report does not contain traceable semantic parts
2	Content of the report	The content reflects the essence of considered problems and basic results received	The content does not fully reflect the essence of the considered problems or basic results received	The content does not fully reflect the essence of the considered problems and basic results received	the content does not reflect the essence of the considered problems and basic results received
3	Possession of the	The student completely	The student possesses the	The student is	The student does not

	material	possesses the presented material, navigates in the problem, freely answers the questions	presented material, navigates in problem, finds it difficult to answer some questions	not enough Fluent in the presented material, poorly navigates in problem	possess the presented material, poorly navigates in problem
4	Compliance with the topic	The presented material fully corresponds to the presented topic	The presented material contains the elements, not Relevant to the topic	The presented material contains large number of the elements, not relevant to the topic	The presented material to the insignificant degree corresponds to the topic

7.3.2. Interim certification

Questions for the discipline exam
Competence UK-1

1. Development of systematic ideas economy and management. System methodology as a research theory.
2. Basic directions of scientific research (elementarism, structural approach).
3. Basic directions of scientific research (functional approach, systems approach).
4. System approach and system analysis and modeling in economics. Principles and postulates of systems analysis.
5. The concept of a "system". Constructive description of social-economic system.
6. Systematic description of socio-economic object of the research.
7. Matrix of system characteristics and principles of its formation.
8. External and internal media of functioning of social-economic system.
9. Matrix systematic characteristics. Input and output parameters.
10. Function and goals of the system development. The concept of multi-functionality.
11. System structure. The concept of poly-structurality.
12. System characteristics. Connections and elements of the system. The concept of a subsystem.
13. System characteristics. CPU systems. Composite processor parts.
14. Principles classifications systems Classification of systems by the degree of complexity and conditionality of action.
15. Principles of classification of systems. Classification of systems by the nature of interaction with the external environment.

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16. Laws and principles of systematic research. Method "blackbox", possibilities of use.
17. Laws and principles of systems research. Feedback principle. Positive and negative reverse communications. Formula of automatic regulation.
18. Laws and principles of systems research. Feedback principle. The concept of a homeostatic system.
19. Laws and principles of systems research. Feedback principle. Automatic regulation formula.
20. Laws and principles of socio-economic systems research. The law of necessary diversity, examples.
21. Peculiarities of socio-economic systems. Specifics of goal-oriented behavior.
22. Peculiarities of socio-economic systems. Specifics of external dynamics.
23. Peculiarities of socio-economic systems. Specifics of internal dynamics.
24. System methods of research of internal environment social-economic objects. System characteristics matrix.
25. System characteristics matrix. Physical and dynamic measurement of system elements.
26. Matrix systemic characteristics. Predicted and control measurement of system elements.
27. Morphological method of research of external environment social-economic system. Basic steps of morphological research
28. System analysis and modeling of external environment. Stratification of the environment and expert determination of the significance of factors.
29. Analysis of external environment socio-economic systems. Methods of identifying key external factors of functioning and development.
30. Construction and grade scenarios of development external of socio-economic environment systems - optimistic, pessimistic and most probable.
31. Methods of identifying and description of "problematic fields" of organization with using a system classifier.
32. System analysis and modeling of the organization targets. Methods of formation of targets. Identify and evaluate key goals.
33. Methods of decomposition of the organization goals. Basic requirements and principles of constructing a “goal tree”.
34. Assessing 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.

Test tasks for the discipline “Modeling of organizational systems” Formation of competence UK-1

1. An image or object that can be displayed to characterize a system is:

A) Original;

B) Subject;
B) Model;
D) Shape.

2. Isomorphism of systems is:
A) The situation of maximum efficiency of a single system;
B) The situation of maximum proximity of the simulated system and the original;
C) The situation of maximum accuracy models and compliance to its modeling purposes;
D) The situation of maximum ease of use of the model.

3. Particular data on individual elements were collected into aggregated indicators for ease of use when building a model. This corresponds to the modeling approach:
A) The principle of simplification;
B) The principle of
aggregation;
B) The principle of animation;
D) The principle of synergy.

4. As the accuracy of the model increases, the convenience of the model changes as follows:
A) Convenience increases;
B) Convenience decreases;
C) Convenience does not
change;
D) These two model parameters are not related in any way.

5. A mathematical model of a process or system that demonstrates a high level of adequacy is distinguished by the following parameters:
A) The model has a high level of usability
B) The model has a high degree of detail
C) The model has a high degree of accuracy
D) The model has high labor intensity

6. A simple model of the functioning of the socio-economic system was constructed. For each element of the system, descriptions of the tasks it performs were given. This is typical for the type of modeling:
A) Fully formalized modeling;
B) Structural modulation;
B) Functional modeling;
D) Topological modeling.

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

A) Fully formalized modeling;
B) Partially formalized modeling;
C) Analogue modeling;
D) Topological modeling.

8. The “gray box” principle in modeling assumes that:

A) The quantitative parameters of the system input and output are known;
B) The quantitative parameters of input and output are known, as well as the functional relationship between key elements within the system;
C) The quantitative parameters of 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;
D) The quantitative parameters of the input and output of the modeled system are unknown.

9. The constructed model for making a profit by an 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...:
A) Accuracy of the system model;
B) Adequacy of the system model;
C) Isomorphism of the system model;
D) Convenience of the system model;
D) Synergy of the system model.

10. When forming a simple tabular model of the system, 4 key parameters were characterized for each object. This is typical for the model type:
A) Object-object model;
B) Object-subject model;
C) Object-property model;
D) Subject-property model.

11. 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:
A) Object-object model;
B) Object-subject model;
C) Object-property model;
D) Subject-property model.

12. Identification of cause-and-effect relationships when constructing a system model is typical when applying a general scientific method:
A) Measurements;

B) Descriptions;
C) Dialectics;
D) Formalization.

13 When modeling the external environment, it was concluded that if the volume of money supply increases in the future period, this would affect the decrease in the exchange rate of the monetary unit. In this case, a general scientific method was used to determine trends:
A) Induction;
B) Deduction;
B) Synthesis;
D) Measurements.

14. The organization's sales volume as of December 31, 2022 amounted to 7,235 units of products. To determine this value, a general scientific method was used:
A) Induction;
B) Deduction;
C) Measurements;
D) Descriptions.

15. General scientific method of description is the basis for carrying out the analysis and building a model. What the description includes:
A) Measurement results of the main elements of the system;
B) Measurement results, structure, hierarchy and interaction of elements;
C) Measurement results, control and feedback of elements in the system;
D) Measurement results, hierarchical structure of system elements.

16. To build an extrapolation forecast model, a numerical series of dynamics was generated based on retrospective information on the development of the process for 2018-2020. What general scientific method is needed to construct it:
A) Dialectics;
B) Induction;
C) Statistical method;
D) Heuristic method.

17. During the strategic foresight session, a working team of industry representatives was formed, those, who assessed future trends in the scientific and technological field using a scoring system. This approach is typical for the category of general scientific methods:
A) Statistical methods;
B) Heuristic methods;
C) Dialectical methods;
D) Formal logical methods.

18. Indicator: price per 1 unit of product. Condition: 34% increase over the previous 4 months. Further growth is possible, as competitors' prices 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 to characterize this environment?
A) Measurement, description, induction;
B) Measurement, description, deduction;
C) Description, synthesis, measurement;
D) Deduction, formally logical method, extrapolation.

19. The essence of correlation and regression analysis is:

A) Continuation of the identified process trends into the future;
B) Determining the strength of functional dependence between elements of a system or process;
C) Characteristic formal sign options for each system parameter;
D) Calculation of the output value and output of the simulated system.

20. A model like Y 3 + 1.2X + 0.4 is an example of a model: A)
linear regression model;
B) Structural functional model;
B) Hierarchical model;
D) Neural network model.

21. In models built by the auto regression method, future (modeled) process values are justified:
A) Functional dependence of external factors;
B) A retrospective series of statistical information;
C) Macroeconomic factors;
D) Weights of individual factors.

22. The 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:
A) 14 16 20 22;
B) 12 15 19 23;
C) 11 19 20 23;
D) 14 18 20 24.

23. Models built by the auto regression method are not suitable for generating results for the following processes:
A) Smoothly changing processes;
B) Processes with high variability;
C) Demographic processes;
D) Processes for which long-term number series are collected.

24. What does neuron activation depend on in neural network models of processes?
A) On the number of output signals;

B) From a strictly defined functional relationship between the input and output of the neuron;
C) From external factors of a higher level;
D) On the content and weight of input signals.

25. In a neural network model built based on Markov chains, the probability of a process transitioning from state H1 to state H2 is estimated at 0.23, and the probability of transition from state H1 to state H3 is estimated at 0.4. What will be the next exact step in the process chain?
A) H1;
B) H2;
C) H3;
D) The process is nonequilibrium and has high variability.

26. At the first level of the hierarchical tree of the CART model, the following restrictions are introduced. If the value of X is greater than a constant, the second level scenario 2.1 is implemented; if the value of X is less than a constant, the second level scenario 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?
A) Scenario 2.1.
B) Scenario 2.2.
C) Both scenarios will be implemented since this is an "AND" tree;
At the first level scenario 2.1 will be selected, at the second level 2.2.

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27. Average meaning between actual and simulated (calculated) indicators for each point in the numerical series of dynamics are:
A) Average relative error;
B) Average absolute error;
C) Mean square error;
D) Dispersion.

27. In the mathematical model, a trend of changes in the studied indicator was derived based on a significant amount of retrospective data. Thus, for a forecast for 1 time point (month), data from at least 36 time points in the retrospective period were used. This model can be recognized:
A) Systemic;
B) Reliable;
C) Accurate;
D) Verified.

28. The accuracy of a process or system model is determined by:
A) The degree of predictive capabilities;

B) Duration of forecast periods;
C) The degree of dispersion of the modeled indicators,
D) Speed of obtaining simulation results.

29. The calculated value for 2020 was 12,400 units, the actual value of the indicator was recorded - 14,000 units. What will be the size of the average absolute error on this date:
A) 1300;
B) 1400;
C) 1500;
D) 1600.

30. The estimated sales volume for 2020 was 750 units, the actual value of the indicator was recorded - 635 units. What will be the accuracy of the result of this model when calculating the average relative error?
A) The accuracy of the model is high;
B) The accuracy of the model is good;
C) The accuracy of the model is satisfactory;
D) The accuracy of the model is unsatisfactory.

31. Extrapolation of trends as a process is:
A) Identification of the strength of connections between elements of the system;
B) Extension of the current trend into the future based on modeling;
C) Qualimetric assessment of trends in the model;
D) Formation of a roadmap for the future process.

32. The main purpose of extrapolation models is:
A) Modeling of the input and output process;
B) Finding the optimal solution among many solutions;
C) Forecasting the future state of a system or process;
D) Distribution of resources between process operations.

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

34. Formation parametric characteristics systems modeling implies:
A) Formation of subjects and objects of the simulated system
B) Quantitative characteristics of all the main elements of the system, determination of their hierarchy
C) Characteristics of the controlled elements of the system
D) Characteristics of the objective function

26. The characterization of controllable and uncontrollable variables when forming an extrapolation model is carried out at the following stage:
A) Stage 1. Formation of the boundaries of the mathematical model.
B) Stage 2. Determination of the technology for creating the model.
C) Stage 3. Formation of parametric characteristics of the system.
D) Stage 4. Setting model constraints.

27. 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. Is this numerical series adequate for forming a forecast model for 2 years using the extrapolation method?
A) The number series is completely suitable
B) The number series is insufficient
C) There are no criteria for evaluating a number series

28. Typical mathematical function of type y ax + b characterized by the following process:
A) Process with variable acceleration;
B) A process with uniform linear development;
C) Slowing down process;
D) An accelerating process.

29. IN analytical table extrapolation models process available the following structural components:
A) The left side includes the forecast base; the right side includes analytical transformations
B) Left side includes results forecast, right side include analytical transformations
C) Left side includes base forecast, rights side includes list subjects of the process
D) The left side includes a list of the main works of the process, the right side a list of those responsible for the result of execution

30. Significant difference between actual and calculated data in analytical table of the extrapolation model, says:
A) This is a feature of the use of extrapolation models;
B) The model is inaccurate (inadequate);
C) This is a type of norm;

D) The model cannot be used completely.

31. In the designed extrapolation model, the result of the process is affected by four factors of the internal and external environment, as well as the time factor t. What category does this model belong to?
A) Simple extrapolation model;
B) Complex extrapolation model;
C) Complex extrapolation model;
D) Adequate extrapolation model.

32. When constructing 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?
A) 59;
B) 65;
C) 68;
D) 74.

33. Interval smoothing extrapolation models, built method moving average is:
A) The totality of growth rates of the numerical series of dynamics;
B) Average value of the numerical series of dynamics;
C) The number of points in the period at which the average value was calculated;
D) The set of average levels of a series of dynamics.

34. The model has the following numerical series of dynamics: 43.2 49.7 55.3 58.2 65.4 69.1. If the value 69.1 is the t value preceding the forecast one, then what will the yt-1 value be equal to for this series?
A) 58.2;
B) 43.2;
C) 65.4;
D) 49.7.

35. The basis for the model using 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?
A) 119.126;
B) 118.125;
C) 129.136;
D) 137.140.

36. Actual numerical series of dynamics in the model used: 123 128 137 144 156 178, smoothed number series (moving average) 129 136 145 159. Determine the forecast value using the model using the moving average method:
A) 159.14;

B) 163.78;
C) 165.5;
D) 162.7.

37. The following process values were obtained for the previous period: 2018 - 3,970, 2019 - 4,100, 2020 - 4,378, and 2021 - 4,965. What will be the value of the absolute increase in the indicator in the period from 2019 to 2020?
A) 238;
B) 278;
C) 298;
D) 310.

38. Based on retrospective information, the following numerical series of dynamics was formed: 378,395,410,437,455. What will the smoothed (calculated) time series of dynamics look like based on the moving average method?
A) 399, 421, 440;
B) 385, 400, 414;
C) 394, 414, 434;
D) 378, 412, 427.

39. The typical size of the smoothing interval when constructing an extrapolation model using the moving average method is:
A) The entire numerical series of dynamics;
B) 3.5 or 7 points;
C) 7, 10, 12 points;
D) The more, the better.

40. To determine the forecast value in the extrapolation model using the moving average method, the expression mt-1 is used. This expression means:
A) The number of levels included in the smoothing interval;
B) The actual value of the indicator under study for the previous period;
C) Moving average for two periods before the forecast;
D) The actual value of the phenomenon under study for two periods preceding the forecast one.

41. The extrapolation model using the moving average method allows us to adequately represent the future value of the process:
A) For 10 or more time points;
B) For 3-4 time points;
C) At 7-8 time points;
D) For 1-2 time points (for example, a month).

42. Peculiarity of extrapolation models method exponentials smoothing is that:

A) Different periods of a numerical (time) series have different importance (weight);
B) It uses the exponential curve equation;
C) It uses correlation-regression equations;
D) It calculates the weighted average over the entire numerical series.

43. IN models exponential smoothing at meaning coefficient importance and those close to 1, the greatest weight is given to the following data:
A) The earliest data in the numerical series of dynamics;
B) All data in the numerical series of dynamics;
C) The latest data in the numerical series of dynamics;
D) A specifically selected unit of data.

44. If it is not possible to set the exact value of the smoothing interval a in the exponential smoothing model, then it is determined:
A) Based on a constant;
B) Based on the process standard;
C) Based on the length of the time series;
D) Based on the regression coefficient.

45. The exponentially weighted average of the beginning of the period is determined based on the following method:
A) The arithmetic mean over the entire number series or the first value of the number series;
B) The modal average over the entire number series or the last value of the number series;
C) Strictly the first value of the number series;
D) The value is taken based on a constant.

46. The basis 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?
A) 0.1;
B) 0.15;
C) 0.25;
D) 0.35.

47. To build a mathematical model, a numerical series of dynamics of 9 units was formed using the exponential smoothing method. Determine, based on the calculation of the smoothing parameter, how the weight of the data in the number series will be distributed:
A) The latest data in the numerical series will have the greatest weight;
B) The very first data in the number series will have the greatest weight;
C) The weight will be distributed over most of the number series;
D) All will have the first value of the numerical series of dynamics.

48. To build the model, the following number 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:

A) 40.5;
B) 45.5;
C) 50.5;
D) 65.5.

49. 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?
A) 489.4;
B) 501.3;
C) 513.6;
D) 528.6.

50. The following actual values of the dynamics number series are available: 375 398 412 455. The smoothing parameter size in the model is 0.45. Determine the predicted value of the process based on the exponential smoothing model if the last actual value was 455:
A) 398.17;
B) 400.5;
C) 437.53;
D) 498.3.

51. The basis for constructing an extrapolation model using the least squares method is:
A) Calculation of the standard deviation of the predicted indicator;
B) Calculation of the exponentially smoothed value of the numerical series of dynamics;
C) Determination of regression coefficients;
D) Calculation of weights of values of the numerical series of dynamics.

52. To display the trends in process changes, the following expression was formed: yt+1 1.2 + blg0.3. What type of process is the process being modeled?
A) Linear development;
B) Exponential development;
C) Development with slower growth;
D) Development with variable acceleration.

53. Name a typical area of application of models based on the method of least squares:
A) Smoothly changing processes;
B) Processes with a voluminous numerical series of retrospective information;
C) Processes with a high degree of variability;
D) Processes with a seasonality factor.

54. Odds regression models method smallest squares are characterized by:
A) The duration of the numerical series of dynamics;

B) The size of the smoothing interval in the
model;
C) Weighted average value by units of the numerical series of dynamics;
D) Functional relationship between the time factor X and the result of the process Y.