

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION  
Federal State Autonomous  
Educational institution of higher education  
"NORTH CAUCASUS FEDERAL UNIVERSITY"

**APPROVED BY**  
Acting Director of the Institute  
of Advanced Engineering,  
Cand. Tech. Sci., Associate Professor  
Porokhnya A.A.

**FUND OF ASSESSMENT TOOLS  
FOR THE STATE FINAL CERTIFICATION**

|                                 |                                                                       |
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| Field of study                  | 11.03.02 Infocommunication Technologies and Communication Systems     |
| Profile                         | Intelligent Data Processing in Infocommunication Systems and Networks |
| Form of study                   | Full-time                                                             |
| Year of start of training       | 2026                                                                  |
| Implemented in the 8th semester |                                                                       |

**AGREED:**

Employer's representative  
General Director of Orintex LLC  
Mironov V.A.

**DEVELOPED BY:**

Professor at the School of Digital, Robotic Systems and Electronics,  
Dr. Tech. Mochalov V.P.

## **Foreword**

### **1. Purpose**

The Fund of Assessment Tools for the State Final Certification is intended to establish the level of professional training of graduates of the direction 11.03.02 Infocommunication Technologies and Communication Systems, to assess the quality of mastering the EP HE and the degree of possession by graduates of the necessary universal (UK-1, UK-2, UK-3, UK-4, UK-5, UK-6, UK-7, UK-8, UK-9, UK-10), general professional (OPK-1, OPK-2, OPK-3, OPK-4, OPK-5), professional competencies (PK-1, PK-2, PK-3, PK-4, PK-5, PK-6, PK-7, PK-8).

2. The fund of assessment tools for the state final certification was developed in accordance with the educational program in the field of training 11.03.02 Infocommunication Technologies and Communication Systems.

3. Developer: Professor of the School of Digital, Robotic Systems and Electronics Mochalov V.P.

4. An examination of the FAT was carried out.

Members of the expert group:

Chairman I.V. Azarov, Acting Director of the Department of Digital, Robotic Systems and Electronics

S.V. Yakovlev, Associate Professor at the School of Digital, Robotic Systems and Electronics.

N.Yu. Bratchenko, Associate Professor at the School of Digital, Robotic Systems and Electronics.

Representative of the employer Orintex LLC V.A. Mironov, General Director of Orintex LLC.

### **Expert opinion**

Recommended for use in the course of the state final certification

5. The validity period of the FAT shall be determined by the period of implementation of the educational programme.

# 1. List of competencies, the level of mastery of which must be checked during the SFC

| Index    | Content of competence                                                                                                                                                                                                       |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UK-(No)  | Universal Competencies                                                                                                                                                                                                      |
| UK-1     | Is able to search, critically analyze and synthesize information, apply a systematic approach to solving problems.                                                                                                          |
| UK-2     | Is able to determine the range of tasks within the framework of the goal and choose the best ways to solve them, based on the current legal norms, available resources and restrictions.                                    |
| UK-3     | Is able to carry out social interaction and fulfill his role in a team.                                                                                                                                                     |
| UK-4     | Is able to carry out business communication in oral and written forms in the state language of the Russian Federation and foreign language(s).                                                                              |
| UK-5     | Is able to perceive the intercultural diversity of society in socio-historical, ethical and philosophical contexts.                                                                                                         |
| UK-6     | Is able to manage his time, build and implement a trajectory of self-development based on the principles of lifelong learning.                                                                                              |
| UK-7     | Is able to maintain the proper level of physical fitness to ensure full social and professional activities                                                                                                                  |
| UK-8     | Is able to create and maintain safe living conditions, including in the event of emergencies.                                                                                                                               |
| UK-9     | Is able to make informed economic decisions in various areas of life                                                                                                                                                        |
| UK-10    | Is able to form an intolerant attitude towards corrupt behavior                                                                                                                                                             |
| OPK-(No) | General professional competencies                                                                                                                                                                                           |
| OPK-1    | Is able to use the provisions, laws and methods of natural sciences and mathematics to solve problems of engineering activities.                                                                                            |
| OPK-2    | Is able to independently conduct experimental research and use the basic methods of processing and presenting the data obtained.                                                                                            |
| OPK-3    | Is able to apply methods of searching, storing, processing, analyzing and presenting information from various sources and databases in the required format, while observing the basic requirements of information security. |
| OPK-4    | Is able to understand the principles of modern information technologies and use them to solve the problems of professional activity.                                                                                        |
| OPK-5    | Is able to develop algorithms and computer programs suitable for practical application.                                                                                                                                     |
| PK-(No)  | Professional competencies                                                                                                                                                                                                   |
|          | Project activities                                                                                                                                                                                                          |
| PK-1     | Is capable of developing switching subsystems and network platforms, data transmission networks, transport networks and radio access networks, satellite communication systems.                                             |

| Index | Content of competence                                                                                                                                                                                                                                                                                                                                                     |
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| PK-2  | Is able to apply modern theoretical and experimental research methods in order to create new promising means of infocommunications, use and implementation of research results                                                                                                                                                                                            |
| PK-3  | Is able to carry out calculations on the design of networks, structures and infocommunication tools in accordance with the terms of reference using both standard methods, techniques and design automation tools, and independently created original programs                                                                                                            |
| PK-4  | Is able to prepare standard technical projects and primary control of compliance of developed projects and technical documentation for various information and communication facilities with national and international standards and technical regulations                                                                                                               |
|       | Technological activities                                                                                                                                                                                                                                                                                                                                                  |
| PK-5  | Is able to carry out installation, configuration, adjustment, testing of equipment, development of operating modes, control of design parameters of operation and testing of communication equipment, ensuring compliance of technical parameters of information and communication systems and / or their components with established operational and technical standards |
| PK-6  | Is able to administer network subsystems of infocommunication systems and/or their components                                                                                                                                                                                                                                                                             |
| PK-7  | Is capable of administering remote access security tools (operating systems and specialized protocols)                                                                                                                                                                                                                                                                    |
| PK-8  | Is capable of performing routine maintenance on network devices and information and communication system software                                                                                                                                                                                                                                                         |

## 2. Description of indicators and criteria for assessing competencies, as well as assessment scales

### 2.1 Description of indicators

| competence,<br>indicator                             | Levels of competence and indicators                                        |                                                                                                                                                                      |                                                                                                                                                                                               |                                                                                                                                                 |
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|                                                      | The minimum level has not<br>been reached<br>(unsatisfactory)<br>2 points  | Minimum level (satisfactory)<br><br>3 points                                                                                                                         | Intermediate level<br>(good)<br><br>4 points                                                                                                                                                  | High level<br>(excellent)<br><br>5 points                                                                                                       |
| <i>Competency: UK-1</i>                              |                                                                            |                                                                                                                                                                      |                                                                                                                                                                                               |                                                                                                                                                 |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 UK-1 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the process of identifying a problem situation, its multivariate analysis and diagnostics based on a systematic approach.                          | Quite confidently identifies a problem situation, carries out its multifactorial analysis and diagnostics based on a systematic approach. Makes minor mistakes.                               | Accurately and reasonably identifies a problem situation, carries out its multifactorial analysis and diagnosis based on a systematic approach. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 UK-1 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the process of searching, selecting and systematizing information to determine alternative options for strategic solutions in a problem situation. | Basically, correctly conducts the search, selection and systematization of information to determine alternative options for strategic solutions in a problem situation. Makes minor mistakes. | Competently searches, selects and systematizes information to determine alternative options for strategic solutions in a problem situation.     |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 UK-1 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the process of identifying and assessing the risks of possible solutions to a problem situation, choosing the best option for its solution.        | In general, correctly identifies and assesses the risks of possible solutions to a problem situation, chooses the best option for its solution. Makes minor mistakes.                         | Competently identifies and assesses the risks of possible solutions to a problem situation, chooses the best option for its solution.           |
| <i>Competency: UK-2</i>                              |                                                                            |                                                                                                                                                                      |                                                                                                                                                                                               |                                                                                                                                                 |

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| Learning outcomes:<br><i>Indicator:</i><br>ID-1 UK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the process of formulating the goal of the project, determining a set of interrelated tasks that ensure its achievement and determining the expected results of solving problems.                                                     | In general, correctly formulates the goal of the project, determines a set of interrelated tasks that ensure its achievement and determines the expected results of solving problems. Makes minor mistakes.                                           | Correctly formulates the goal of the project, determines a set of interrelated tasks that ensure its achievement and determines the expected results of solving problems.                                                          |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 UK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the process of developing an action plan to solve the tasks of the project, choosing a way to solve them, based on the current legal norms and available resources and restrictions.                                                  | In general, he correctly develops an action plan to solve the problems of the project, choosing the best way to solve them, based on the current legal norms and available resources and restrictions. Makes minor mistakes.                          | Accurately and reasonably develops an action plan to solve the tasks of the project, choosing the best way to solve them, based on the current legal norms and available resources and constraints.                                |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 UK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the process of ensuring the implementation of the project in accordance with the established goals, deadlines and costs, based on current legal regulations, available resources and constraints, including the use of digital tools. | Generally ensures that the project is carried out correctly in accordance with the set goals, deadlines and costs, based on current legal regulations, available resources and constraints, including the use of digital tools. Makes minor mistakes. | Competently ensures the implementation of the project in accordance with the established goals, deadlines and costs, based on current legal regulations, available resources and restrictions, including the use of digital tools. |
| <b>Competence: UK-3</b>                              |                                                                            |                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                    |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 UK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when participating in interpersonal and group interactions, partly using an inclusive approach, effective communication, team-building and                                                                                               | Quite confidently participates in interpersonal and group interaction, using an inclusive approach, effective communication, methods of team building and team interaction when work-                                                                 | Fully participates in interpersonal and group interactions, effectively using an inclusive approach, effective communication, team-building and teamwork methods when                                                              |

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|                                                      |                                                                            | teamwork methods when working together within the framework of the task.                                                                                                                                                                                                        | ing together within the framework of the task. Makes minor mistakes.                                                                                                                                                                                                                                      | working together within the framework of the task.                                                                                                                                                                                                                               |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 UK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when ensuring the work of the team in order to obtain optimal results of joint work, taking into account the individual capabilities of its members, the use of methodology for achieving success, methods, information technologies and foresight technologies. | In general, he correctly ensures the work of the team in order to obtain optimal results of joint work, taking into account the individual capabilities of its members, the use of methodology for achieving success, methods, information technologies and foresight technologies. Makes minor mistakes. | Ensures the work of the team with great efficiency in order to obtain optimal results of joint work, taking into account the individual capabilities of its members, the use of methodology for achieving success, methods, information technologies and foresight technologies. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 UK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in ensuring that tasks are completed based on monitoring teamwork and responding to significant deviations.                                                                                                                                                      | Generally correctly ensures the implementation of assigned tasks based on monitoring teamwork and responding to significant deviations. Makes minor mistakes.                                                                                                                                             | With great efficiency, it ensures the fulfillment of tasks based on the monitoring of teamwork and timely response to significant deviations.                                                                                                                                    |
| <b>Competency: UK-4</b>                              |                                                                            |                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                  |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 UK-4 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when choosing the style of business communication in the state and foreign languages, verbal and non-verbal means of interaction with partners in oral and written forms.                                                                                        | In general, he correctly chooses an acceptable style of business communication in the state and foreign languages, verbal and non-verbal means of interaction with partners in oral and written forms. Makes minor mistakes.                                                                              | Independently and competently chooses an acceptable style of business communication in the state and foreign languages, verbal and non-verbal means of interaction with partners in oral and written forms.                                                                      |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 UK-4 | Unable to complete tasks related to this competency achievement indicator. | Insufficiently applies in practice communication technologies,                                                                                                                                                                                                                  | Quite confidently uses information and communication tech-                                                                                                                                                                                                                                                | He fully uses information and communication technologies to increase the efficiency of                                                                                                                                                                                           |

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|                                                      |                                                                            | methods and methods of business communication for academic and professional interaction.                                                                                                                                                                | nologies to increase the efficiency of professional interaction, search for the necessary information in the process of solving standard communicative tasks in the state and foreign languages. Makes minor mistakes.                                               | professional interaction, high-quality search for the necessary information in the process of solving standard communicative tasks in the state and foreign languages.                                                               |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 UK-4 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when assessing the effectiveness of the communication technologies used in professional interaction in the state and foreign languages, as well as when choosing the optimal ones.                                                       | Quite confidently evaluates the effectiveness of the applied communicative technologies in professional interaction in the state and foreign languages, basically correctly chooses the optimal ones. Makes minor mistakes.                                          | Competently evaluates the effectiveness of the applied communication technologies in professional interaction in the state and foreign languages, independently makes a choice of the optimal ones.                                  |
| <b>Competency: UK-5</b>                              |                                                                            |                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                      |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 UK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when identifying, comparing and analyzing information about the cultural characteristics and traditions of various social groups, to choose a strategy for interacting with their carriers.                                              | Quite confidently identifies, compares and analyzes information about the cultural characteristics and traditions of various social groups, to choose a strategy for interaction with their carriers. Makes minor mistakes.                                          | Independently and competently identifies, compares and analyzes information about the cultural characteristics and traditions of various social groups, in order to choose the optimal strategy for interaction with their carriers. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 UK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when demonstrating respect for the historical heritage and socio-cultural traditions of various social groups, based on knowledge of the stages of historical development of Russia (including the main events, main historical figures) | In general, he demonstrates a respectful attitude to the historical heritage and socio-cultural traditions of various social groups, based on knowledge of individual stages of the historical development of Russia (including the main events, the main historical | Fully and independently demonstrates respect for the historical heritage and socio-cultural traditions of various social groups, based on knowledge of the stages of historical development of Russia (including the main events,    |

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|                                                      |                                                                            | in the context of world history and a number of cultural traditions of the world (depending on the environment and the tasks of education), including some world religions, philosophical and ethical teachings.                                                                                                                                                                            | figures) in the context of world history and a number of cultural traditions of the world (depending on the environment and the tasks of education), including some world religions, philosophical and ethical teachings. Makes minor mistakes.                                                                                                                                                        | the main historical figures) in the context of world history and a number of cultural traditions of the world (depending on the environment and the tasks of education), including various world religions, philosophical and ethical teachings.                                                                                                                        |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 UK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when choosing ways of constructive interaction with people, taking into account their socio-cultural characteristics in order to successfully perform professional tasks and strengthen social integration.                                                                                                                                                                  | Quite confidently chooses ways of constructive interaction with people, taking into account their socio-cultural characteristics, in order to successfully perform professional tasks and strengthen social integration. Makes minor mistakes.                                                                                                                                                         | Independently and responsibly chooses ways of constructive interaction with people, taking into account their socio-cultural characteristics, in order to successfully perform professional tasks and strengthen social integration.                                                                                                                                    |
| Learning outcomes:<br><i>Indicator:</i><br>ID-4 UK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the analysis of various socio-cultural trends, facts and phenomena on the basis of a holistic view of the foundations of the universe and the prospects for its development, insufficiently understands the relationship between the diversity of worldviews and the course of development of history, science, man's ideas about nature, society, cognition and himself. | Quite confidently analyzes various socio-cultural trends, facts and phenomena on the basis of a holistic view of the foundations of the universe and the prospects for its development, in general understands the relationship between the diversity of worldviews and the course of development of history, science, human ideas about nature, society, cognition and himself. Makes minor mistakes. | Fully analyzes various socio-cultural trends, facts and phenomena on the basis of a holistic view of the foundations of the universe and the prospects for its development, independently understands the relationship between the diversity of worldviews and the course of development of history, science, human ideas about nature, society, cognition and himself. |
| <b>Competency: UK-6</b>                              |                                                                            |                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                         |

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| Learning outcomes:<br><i>Indicator:</i><br>ID-1 UK-6 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in determining personal and professional goals in accordance with the level of his resources and priorities of actions, for successful development in the chosen field of professional activity.                                                                                          | Quite confidently sets personal and professional goals in accordance with the level of his resources and priorities of actions, for successful development in the chosen field of professional activity. Makes minor mistakes.                                                                                    | Independently and competently sets personal and professional goals in accordance with the level of his resources and priorities of actions, for successful development in the chosen field of professional activity.                                                                       |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 UK-6 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the implementation and adjustment of the strategy of personal and professional development, taking into account the conditions, means, personal capabilities, stages of career growth, the time perspective of the development of activities and the requirements of the labor market. | In general, correctly implements and adjusts the strategy of personal and professional development, taking into account the conditions, means, personal capabilities, stages of career growth, time perspective for the development of activities and the requirements of the labor market. Makes minor mistakes. | Independently, fully implements and adjusts the strategy of personal and professional development, taking into account the conditions, means, personal capabilities, stages of career growth, time perspective for the development of activities and the requirements of the labor market. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 UK-6 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the course of critical assessment of the effectiveness of the use of time and other resources in solving tasks in the chosen field of professional activity.                                                                                                                           | Basically, he critically evaluates the effectiveness of the use of time and other resources in solving tasks in the chosen field of professional activity. Makes minor mistakes.                                                                                                                                  | Fully critically assesses the effectiveness of the use of time and other resources in solving tasks in the chosen field of professional activity.                                                                                                                                          |
| <b>Competency: UK-7</b>                              |                                                                            |                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                            |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 UK-7 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the use of health-saving technologies to ensure full-fledged social and professional activities, taking into                                                                                                                                                                           | He mainly uses health-saving technologies to ensure full-fledged social and professional activities, taking into account the physiological characteristics of                                                                                                                                                     | Fully uses health-saving technologies to ensure full-fledged social and professional activities, taking into account the physiological characteristics of the body and living conditions.                                                                                                  |

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|                                                      |                                                                            | account the physiological characteristics of the body and living conditions.                                                                                                                                                                                                                                  | the body and living conditions. Makes minor mistakes.                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                              |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 UK-7 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in planning his work and free time for the optimal combination of physical and mental load and ensuring efficiency in professional activities.                                                                                                                                                 | Sufficiently plans his working and free time for the optimal combination of physical and mental load and ensuring efficiency in professional activities. Makes minor mistakes.                                                                                                                                      | Fully plans his working and free time for the optimal combination of physical and mental load and ensuring efficiency in professional activities.                                                                                                                            |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 UK-7 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in maintaining the proper level of physical fitness to ensure full-fledged social and professional activities and in observing the norms of a healthy lifestyle.                                                                                                                               | Sufficiently maintains the proper level of physical fitness to ensure full social and professional activities and observes the norms of a healthy lifestyle. Makes minor mistakes.                                                                                                                                  | Fully maintains the proper level of physical fitness to ensure full-fledged social and professional activities and observes the norms of a healthy lifestyle.                                                                                                                |
| <b>Competence: UK-8</b>                              |                                                                            |                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                              |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 UK-8 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in ensuring security and sustainable development in various spheres of life; as well as in classifying military emergencies, based on knowledge of the principles and methods of organizing the protection of the population from dangers arising in peacetime and during military operations. | Basically, correctly ensures safety and sustainable development in various spheres of life; classifies military emergencies based on knowledge of the principles and methods of organizing the protection of the population from dangers arising in peacetime and during military operations. Makes minor mistakes. | Competently ensures safety and sustainable development in various spheres of life; classifies military emergencies based on knowledge of the principles and methods of organizing the protection of the population from dangers arising in peacetime and during hostilities. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 UK-8 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when assessing the probability of potential danger in everyday life and professional activities and taking measures to prevent it.                                                                                                                                                             | In general, correctly assesses the probability of potential danger in everyday life and professional activities and takes measures to prevent it.                                                                                                                                                                   | Fully assesses the probability of potential danger in everyday life and professional activities and takes effective measures to prevent it.                                                                                                                                  |

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|                                                      |                                                                            |                                                                                                                                                                                   | prevent it. Makes minor mistakes.                                                                                                                                                                      |                                                                                                                                                                                    |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 UK-8 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the application of basic methods of protection in the threat and occurrence of emergencies and military conflicts in everyday life and professional activities. | In general, correctly applies the basic methods of protection in the threat and occurrence of emergencies and military conflicts in everyday life and professional activities. Makes minor mistakes.   | With great efficiency, he applies the basic methods of protection in the threat and occurrence of emergencies and military conflicts in everyday life and professional activities. |
| <b>Competency: UK-9</b>                              |                                                                            |                                                                                                                                                                                   |                                                                                                                                                                                                        |                                                                                                                                                                                    |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 UK-9 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding the basic principles of the functioning of the economy and economic development, the goals and forms of state participation in the economy.       | In general, he correctly understands the basic principles of the functioning of the economy and economic development, the goals and forms of state participation in the economy. Makes minor mistakes. | Fully understands the basic principles of the functioning of the economy and economic development, the goals and forms of state participation in the economy.                      |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 UK-9 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the course of applying personal economic and financial planning methods to achieve current and long-term financial goals.                                       | In general, correctly applies the methods of personal economic and financial planning to achieve current and long-term financial goals. Makes minor mistakes.                                          | Competently applies the methods of personal economic and financial planning to achieve current and long-term financial goals.                                                      |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 UK-9 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when using financial instruments to manage personal finances, as well as when controlling their own economic and financial risks.                                  | Basically, he correctly uses financial instruments to manage personal finances, controls his own economic and financial risks. Makes minor mistakes.                                                   | Competently and independently uses financial instruments to manage personal finances, controls his own economic and financial risks.                                               |
| <b>Competence: UK-10</b>                             |                                                                            |                                                                                                                                                                                   |                                                                                                                                                                                                        |                                                                                                                                                                                    |

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| Learning outcomes:<br><i>Indicator:</i><br>ID-1 UK-10 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the current legal norms that ensure the fight against corruption in various areas of life, in the ways of preventing corruption and forming an intolerant attitude towards it.    | He is sufficiently familiar with the current legal norms that ensure the fight against corruption in various areas of life, with ways to prevent corruption and form an intolerant attitude towards it. | He is fully familiar with the current legal norms that ensure the fight against corruption in various areas of life, with ways to prevent corruption and form an intolerant attitude towards it. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 UK-10 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the prevention of corruption risks in professional activities; in the exclusion of interference in his/her professional activities in cases of inducement to corruption offenses. | Sufficiently prevents corruption risks in professional activities; excludes interference in their professional activities in cases of inducement to corruption offenses.                                | Fully prevents corruption risks in professional activities; excludes interference in his/her professional activities in cases of inducement to corruption offenses.                              |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 UK-10 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in interaction in society based on intolerance of corruption.                                                                                                                        | It almost unmistakably interacts in society on the basis of an intolerant attitude to corruption.                                                                                                       | He fully interacts in society on the basis of an intolerant attitude to corruption.                                                                                                              |
| <b>Competency: OPK-1</b>                              |                                                                            |                                                                                                                                                                                                     |                                                                                                                                                                                                         |                                                                                                                                                                                                  |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 OPK-1 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding the fundamental laws of nature and the basic physical mathematical laws and methods of accumulating, transmitting and processing information.                       | Generally correctly understands the fundamental laws of nature and the basic physical mathematical laws and methods of accumulating, transmitting and processing information. Makes minor mistakes.     | Fully understands the fundamental laws of nature and the basic physical mathematical laws and methods of accumulating, transmitting and processing information.                                  |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 OPK-1 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the course of applying physical laws and mathematical methods to solve problems of a theoretical and applied nature.                                                              | Basically, correctly applies physical laws and mathematical methods to solve problems of a theoretical and applied nature. Makes minor mistakes.                                                        | Competently applies physical laws and mathematical methods to solve problems of a theoretical and applied nature.                                                                                |

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| Learning outcomes:<br><i>Indicator:</i><br>ID-3 OPK-1 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the course of using knowledge of physics and mathematics in solving practical problems.                                              | Basically, correctly uses knowledge of physics and mathematics when solving practical problems. Makes minor mistakes.                                                 | Uses knowledge of physics and mathematics with great efficiency in solving practical problems.                                                  |
| <b>Competency: OPK-2</b>                              |                                                                            |                                                                                                                                                        |                                                                                                                                                                       |                                                                                                                                                 |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 OPK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the search and critical analysis of information necessary to solve the problem.                                                      | In general, correctly finds and critically analyzes the information necessary to solve the problem. Makes minor mistakes.                                             | Competently finds and critically analyzes the information necessary to solve the problem.                                                       |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 OPK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the course of developing a solution to a specific problem, choosing the best option, assessing its advantages and disadvantages.     | Basically, he correctly develops a solution to a specific problem, choosing the best option, evaluating its advantages and disadvantages. Makes minor mistakes.       | Independently and competently develops a solution to a specific problem, choosing the best option, evaluating its advantages and disadvantages. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 OPK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding the basic methods and means of conducting experimental research, as well as standardization and certification systems. | In general, he correctly understands the main methods and means of conducting experimental research, standardization and certification systems. Makes minor mistakes. | Fully understands the basic methods and means of conducting experimental research, standardization and certification systems.                   |
| Learning outcomes:<br><i>Indicator:</i><br>ID-4 OPK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the course of choosing methods and means of measurement and conducting experimental research.                                        | In general, he correctly chooses methods and means of measurement and conducts experimental research. He makes minor mistakes.                                        | Competently and independently chooses methods and means of measurement and effectively conducts experimental research.                          |
| Learning outcomes:<br><i>Indicator:</i><br>ID-5 OPK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the application of methods for processing and presenting the data obtained,                                                          | Quite confidently knows the methods of processing and pre-                                                                                                            | He is fully proficient in the methods of processing and presenting the data obtained                                                            |

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|                                                       |                                                                            | as well as assessing the error of measurement results.                                                                                                                                                                                                                                             | sending the data obtained and assessing the error of measurement results. Makes minor mistakes.                                                                                                                                                                                                                            | and assessing the error of measurement results.                                                                                                                                                                                                                          |
| <b>Competency: OPK-3</b>                              |                                                                            |                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                          |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 OPK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding the basic patterns of information transmission in information and communication systems, the main types of signals used in telecommunication systems, the features of the transmission of various signals through channels and paths of telecommunication systems. | In general, correctly understands the basic patterns of information transmission in information and communication systems, the main types of signals used in telecommunication systems, the features of the transmission of various signals through channels and paths of telecommunication systems. Makes minor mistakes. | Fully understands the basic patterns of information transmission in infocommunication systems, the main types of signals used in telecommunication systems, the features of the transmission of various signals through channels and paths of telecommunication systems. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 OPK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding the principles, basic algorithms and devices of digital signal processing; the principles of building telecommunication systems of various types and methods of information distribution in communication networks.                                                | In general, he correctly understands the principles, basic algorithms and devices of digital signal processing; the principles of building telecommunication systems of various types and methods of information distribution in communication networks. Makes minor mistakes.                                             | Fully understands the principles, basic algorithms and devices of digital signal processing; the principles of building telecommunication systems of various types and methods of information distribution in communication networks.                                    |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 OPK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when solving data processing problems using computer technology.                                                                                                                                                                                                                    | Basically, correctly solves data processing problems using computer technology. Makes minor mistakes.                                                                                                                                                                                                                      | Competently and independently solves the problems of data processing with the help of computer technology.                                                                                                                                                               |
| Learning outcomes:<br><i>Indicator:</i><br>ID-4 OPK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the development of probabilistic models for specific processes, carrying out the necessary calculations within                                                                                                                                                                   | Basically, correctly builds probabilistic models for specific processes, conducts the necessary                                                                                                                                                                                                                            | Independently builds probabilistic models for specific processes, competently conducts the necessary calculations                                                                                                                                                        |

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|                                                       |                                                                            | the framework of the constructed model.                                                                                                                                                                               | calculations within the framework of the built model. Makes minor mistakes.                                                                                                                                                                                 | within the framework of the built model.                                                                                                                                                        |
| Learning outcomes:<br><i>Indicator:</i><br>ID-5 OPK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when using information security methods.                                                                                                                                                               | He mainly knows the methods and skills of ensuring information security. Makes minor mistakes.                                                                                                                                                              | He is fluent in the methods and skills of ensuring information security.                                                                                                                        |
| <b>Competency: OPK-4</b>                              |                                                                            |                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                             |                                                                                                                                                                                                 |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 OPK-4 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when using information and communication technologies when searching for the necessary information.                                                                                                    | Basically, correctly uses information and communication technologies when searching for the necessary information. Makes minor mistakes.                                                                                                                    | Makes full use of information and communication technologies when searching for the necessary information.                                                                                      |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 OPK-4 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when designing a solution to a specific project problem, choosing the best way to solve it, based on current legal norms and available resources and restrictions.                                     | In general, correctly designs the solution to a specific project problem, choosing the best way to solve it, based on the current legal norms and available resources and restrictions. Makes minor mistakes.                                               | Competently and independently designs a solution to a specific project task, choosing the best way to solve it, based on current legal norms and available resources and restrictions.          |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 OPK-4 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding modern interactive software systems and basic methods of processing experimental data, including the use of standard software, general-purpose and special-purpose software packages. | In general, the child correctly understands modern interactive software systems and the basic methods of processing experimental data, including the use of standard software, general-purpose and special-purpose software packages. Makes minor mistakes. | Fully understands modern interactive software systems and basic methods of processing experimental data, including the use of standard software, general and special-purpose software packages. |

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| Learning outcomes:<br><i>Indicator:</i><br>ID-4 OPK-4 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the use of the capabilities of computer technology and software to solve problems of control and algorithmization of information processing processes.                            | Basically, correctly uses the capabilities of computer technology and software to solve problems of control and algorithmization of information processing processes. Makes minor mistakes.                            | With great efficiency, it uses the capabilities of computer technology and software to solve problems of control and algorithmization of information processing processes.             |
| Learning outcomes:<br><i>Indicator:</i><br>ID-5 OPK-4 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when using methods of computer modeling of physical processes in the transmission of information, as well as the use of engineering and computer graphics techniques.                | He is quite confident in the methods of computer modeling of physical processes in the transmission of information, engineering and computer graphics techniques. He makes minor mistakes.                             | He is fully proficient in the methods of computer modeling of physical processes in the transmission of information, engineering and computer graphics techniques.                     |
| <b>Competence: OPK-5</b>                              |                                                                            |                                                                                                                                                                                                     |                                                                                                                                                                                                                        |                                                                                                                                                                                        |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 OPK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when choosing programming languages and languages for working with databases, environments for the development of information systems and technologies, based on the existing tasks. | Quite confidently chooses programming languages and languages for working with databases, environments for the development of information systems and technologies, based on the existing tasks. Makes minor mistakes. | Competently chooses programming languages and languages for working with databases, environments for the development of information systems and technologies, based on existing tasks. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 OPK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when reading the codes of software products written in mastered programming languages, and making the required changes.                                                              | Reads the codes of software products written in mastered programming languages quite confidently and makes the necessary changes. Makes minor mistakes.                                                                | Competently and independently reads the codes of software products written in mastered programming languages, and makes the required changes.                                          |

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| Learning outcomes:<br><i>Indicator:</i><br>ID-3OPK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the development of original algorithms and computer programs suitable for practical application.                                                                                                                                                                                                                                                                                           | Quite confidently develops original algorithms and computer programs suitable for practical use. Makes minor mistakes.                                                                                                                                                                                                                                                                                                 | With great efficiency, it develops original algorithms and computer programs suitable for practical application.                                                                                                                                                                                                                                                                  |
| <b>Competency: PK-1</b>                              |                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                   |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 PK-1 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding and orientation in the principles of construction and operation of communication networks, including their constituent subsystems, and signaling protocols, standards for the quality of data, voice and video transmission used in communication networks, in the legislation of the Russian Federation in the field of communications.                                     | In general, he correctly understands and orients himself in the principles of construction and operation of communication networks, including their constituent subsystems, and signaling protocols, standards for the quality of data, voice and video transmission used in communication networks, in the legislation of the Russian Federation in the field of communications. Makes minor mistakes.                | Fully understands and is guided by the principles of construction and operation of communication networks, including their constituent subsystems, and signaling protocols, standards for the quality of data, voice and video transmission used in communication networks, in the legislation of the Russian Federation in the field of communications.                          |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 PK-1 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the analysis of statistical parameters of traffic, the development of decisions on the operational reconfiguration of the network, changing the parameters of the switching subsystem, network platforms, the use of equipment of new technologies; as well as changing and adjusting the parameters of the switching subsystem, transport networks and data transmission networks, on the | In general, it correctly analyzes the statistical parameters of traffic, develops solutions for the prompt reconfiguration of the network, changing the parameters of the switching subsystem, network platforms, for the use of equipment for new technologies; changing and adjusting the parameters of the switching subsystem, transport networks and data transmission networks, for organizing new and expanding | Competently analyzes the statistical parameters of traffic, develops solutions for the prompt reconfiguration of the network, changing the parameters of the switching subsystem, network platforms, for the use of new technology equipment; changing and adjusting the parameters of the switching subsystem, transport networks and data transmission networks, for organizing |

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|                                                      |                                                                            | organization of new and expansion of existing communication directions.                                                                                                                                                                                                                                                                                                                                                                      | existing communication directions. Makes minor mistakes.                                                                                                                                                                                                                                                                                                                                                                                | new and expanding existing communication directions.                                                                                                                                                                                                                                                                                                                                                                     |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 PK-1 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the analysis of statistics of the main performance indicators of radio systems and data transmission systems, the development of measures to maintain them at the required level, and the calculation of the capacity of telecommunication networks.                                                                                                                                                                       | Basically , correctly analyzes the statistics of the main indicators of the efficiency of radio systems and data transmission systems, develops measures to maintain them at the required level, and calculates the bandwidth of telecommunications networks. Makes minor mistakes.                                                                                                                                                     | Independently analyzes the statistics of the main performance indicators of radio systems and data transmission systems, develops measures to maintain them at the required level, and calculates the capacity of telecommunications networks.                                                                                                                                                                           |
| Learning outcomes:<br><i>Indicator:</i><br>ID-4 PK-1 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the development of communication schemes and integration of new network elements, the construction and expansion of the switching subsystem and network platforms; the performance of work on switching equipment, the deployment of service platform equipment, the equipment of new technologies on the network, the implementation of plans to expand the existing equipment of network platforms and new technologies. | Quite confidently develops schemes for the organization of communication and integration of new network elements, builds and expands the switching subsystem and network platforms; performs work on switching equipment, deploys equipment of service platforms, equipment of new technologies on the network, fulfills plans for the expansion of existing equipment of network platforms and new technologies. Makes minor mistakes. | With great efficiency, develops schemes for the organization of communication and integration of new network elements, builds and expands the switching subsystem and network platforms; performs work on switching equipment, deploys equipment for service platforms, equipment for new technologies on the network, fulfills plans for the expansion of existing equipment of network platforms and new technologies. |
| <i>Competency: PK-2</i>                              |                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                          |

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| Learning outcomes:<br><i>Indicator:</i><br>ID-1 PK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding the basics of electrical engineering, network technologies, principles of operation, indicators of the use and functioning of telecommunication equipment, the requirements of technical regulations, international and national standards and other regulatory documents in the field of assessing the quality indicators of the operation of information and communication equipment. | In general, he correctly understands the basics of electrical engineering, network technologies, principles of operation, indicators of the use and functioning of telecommunication equipment, the requirements of technical regulations, international and national standards and other regulatory documents in the field of assessing the quality indicators of information and communication equipment. Makes minor mistakes. | Fully understands the basics of electrical engineering, network technologies, principles of operation, indicators of the use and functioning of telecommunication equipment, the requirements of technical regulations, international and national standards and other regulatory documents in the field of assessing the quality indicators of information and communication equipment. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 PK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in compliance with the requirements of programs and methods for conducting experimental tests of communication facilities and systems (information and communication equipment).                                                                                                                                                                                                                         | Quite confidently complies with the requirements of programs and methods for conducting experimental tests of objects and communication systems (information and communication equipment). Makes minor mistakes.                                                                                                                                                                                                                  | Fully complies with the requirements of programs and methods for conducting experimental tests of communication facilities and systems (information and communication equipment).                                                                                                                                                                                                        |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 PK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when working with software used in the processing of information of information and communication systems and their components, technical means of data collection and processing, with various information systems and databases.                                                                                                                                                                       | In general, it correctly works with software used in the processing of information from infocommunication systems and their components, technical means of data collection and processing, with various information systems and databases. Makes minor mistakes.                                                                                                                                                                  | Competently and independently works with software used in the processing of information from infocommunication systems and their components, technical means of data collection and processing, with various information systems and databases.                                                                                                                                          |

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| Learning outcomes:<br><i>Indicator:</i><br>ID-4 PK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when monitoring the quality indicators of information and communication equipment in accordance with their standard indicators.                                                                                                                                                     | In general, correctly controls the quality indicators of the information and communication equipment in accordance with their regulatory indicators. Makes minor mistakes.                                                                                                                                                | Effectively controls the quality indicators of the operation of information and communication equipment in accordance with their regulatory indicators.                                                                                                                           |
| Learning outcomes:<br><i>Indicator:</i><br>ID-5 PK-2 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when conducting experimental studies on existing programs and methods of testing objects and communication systems (information and communication equipment) in order to assess their quality performance.                                                                          | In general, he correctly conducts experimental research on the existing programs and methods of testing objects and communication systems (information and communication equipment) in order to assess their quality performance. Makes minor mistakes.                                                                   | Competently and independently conducts experimental research on existing programs and methods of testing objects and communication systems (information and communication equipment) in order to assess their quality performance.                                                |
| <b>Competency: PK-3</b>                              |                                                                            |                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                   |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 PK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the understanding of regulatory, regulatory, technical, organizational and methodological documents governing the design preparation, implementation and operation of communication systems (telecommunication systems), the construction of facilities and communication lines. | In general, he correctly understands the regulatory, normative, technical, organizational and methodological documents governing the design preparation, implementation and operation of communication systems (telecommunication systems), the construction of facilities and communication lines. Makes minor mistakes. | Fully understands the regulatory, regulatory, technical, organizational and methodological documents governing the design preparation, implementation and operation of communication systems (telecommunication systems), the construction of facilities and communication lines. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 PK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the application of technologies used on the transport network, with modern requirements for performance,                                                                                                                                                                         | Basically, correctly operates the technologies used on the transport network, modern requirements for performance,                                                                                                                                                                                                        | Perfectly operates with the technologies used in the transport network, modern requirements for performance,                                                                                                                                                                      |

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|                                                      |                                                                            | availability, security, scalability, integration of technologies, manageability of communication systems (telecommunications); principles of planning the capacity of radio access networks.                                     | availability, security, scalability, technology integration, manageability of communication systems (telecommunications); principles of planning the capacity of radio access networks. Makes minor mistakes.                                                 | availability, security, scalability, technology integration, manageability of communication systems (telecommunications); principles of planning the capacity of radio access networks.                                                     |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 PK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when calculating the parameters and characteristics of the network and infocommunication tools, analyzing their quality indicators based on statistics and radio measurements, using specialized design software. | Basically, correctly calculates the parameters and characteristics of the network and infocommunication tools, analyzes their qualitative indicators based on statistics and radio measurements, uses specialized design software. Makes minor mistakes.      | Competently and independently calculates the parameters and characteristics of the network and infocommunication tools, analyzes their qualitative indicators based on statistics and radio measurements, uses specialized design software. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-4 PK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when identifying and analyzing the advantages and disadvantages of design solutions, assessing the risks associated with the implementation of the project.                                                       | Quite confidently identifies and analyzes the advantages and disadvantages of design solutions, assesses the risks associated with the implementation of the project. Makes minor mistakes.                                                                   | Competently and independently identifies and analyzes the advantages and disadvantages of design solutions, assesses the risks associated with the implementation of the project.                                                           |
| Learning outcomes:<br><i>Indicator:</i><br>ID-5 PK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when collecting initial data for the design of the network and infocommunication tools, determining the optimal configuration and topology of the transport network; developing technical solutions for the       | Quite confidently collects initial data for the design of the network and infocommunication facilities, determining the optimal configuration and topology of the transport network; develops technical solutions for the implementation of the communication | Independently collects initial data for the design of the network and infocommunication tools, determines the optimal configuration and topology of the transport network; competently develops technical solutions for the implementation  |

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|                                                      |                                                                            | implementation of the communication system (telecommunication system) and its components.                                                                                                                                                                                                                                                 | system (telecommunication system) and its components. Makes minor mistakes.                                                                                                                                                                                                                                                                                            | of the communication system (telecommunication system) and its components.                                                                                                                                                                                                                                                           |
| Learning outcomes:<br><i>Indicator:</i><br>ID-6 PK-3 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the development of circuit design solutions for the components of radio electronic facilities, the selection of the element base for the development of circuit solutions, the conduct of automated modeling and experimental work to check the technical characteristics of the modernized radio electronic facilities | Quite confidently carries out the development of circuit design solutions for the components of radio-electronic facilities, the selection of the element base for the development of circuit solutions, conducts automated modeling and experimental work to check the technical characteristics of the modernized radio-electronic facilities. Makes minor mistakes. | Fully carries out the development of circuit design solutions for the components of radio electronic facilities, the selection of the element base for the development of circuit solutions, conducts automated modeling and experimental work to check the technical characteristics of the modernized radio electronic facilities. |
| <b>Competency: PK-4</b>                              |                                                                            |                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                      |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 PK-4 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in compliance with the principles of the system approach in the design of communication systems (telecommunications), infocommunication facilities and their components, requirements for the development of technical documentation.                                                                                      | In general, correctly observes the principles of the system approach in the design of communication systems (telecommunications), infocommunication facilities and their components, the requirements for the development of technical documentation. Makes minor mistakes.                                                                                            | Fully complies with the principles of the system approach in the design of communication systems (telecommunications), infocommunication facilities and their components, the requirements for the development of technical documentation.                                                                                           |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 PK-4 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding and orientation in the principles of construction and operation of infocommunication tools and their components, modern                                                                                                                                                                                   | In general, he correctly understands and navigates the principles of construction and operation of infocommunication tools and their components, modern                                                                                                                                                                                                                | Fully understands and is guided by the principles of construction and operation of infocommunication tools and their components, modern                                                                                                                                                                                              |

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|                                                      |                                                                            | technical solutions for the implementation of communication systems (telecommunication systems) and its components, the software used.                                                                                                                                                                                                                                      | technical solutions for the implementation of communication systems (telecommunication systems) and its components, the software used. Makes minor mistakes.                                                                                                                                                                                                                                      | technical solutions for the implementation of communication systems (telecommunication systems) and its components, and the software used.                                                                                                                                                                                                                                              |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 PK-4 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the development of project documentation in accordance with standards and technical regulations; development and presentation of presentation materials on the project.                                                                                                                                                                                   | Quite confidently develops project documentation in accordance with standards and technical regulations; develops and presents presentation materials for the project. Makes minor mistakes.                                                                                                                                                                                                      | Competently and independently develops project documentation in accordance with standards and technical regulations; develops and submits presentation materials for the project.                                                                                                                                                                                                       |
| Learning outcomes:<br><i>Indicator:</i><br>ID-4 PK-4 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the course of developing technical solutions when creating a communication system (telecommunication system) and its components; preparing a communication organization scheme, equipment placement plan, passage scheme and other necessary documents; estimating the costs of creating (modernizing) a communication system (telecommunication system). | Basically, correctly develops technical solutions for the creation of a communication system (telecommunication system) and its components; prepares a communication organization scheme, equipment placement plan, passage scheme and other necessary documents; estimates of costs for the creation (modernization) of a communication system (telecommunication system). Makes minor mistakes. | Accurately and reasonably develops technical solutions for the creation of a communication system (telecommunication system) and its components; preparation of a communication organization scheme, equipment placement plan, passage scheme and other necessary documents; estimation of costs for the creation (modernization) of a communication system (telecommunication system). |
| <b>Competency: PK-5</b>                              |                                                                            |                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                         |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 PK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when understanding the current industry                                                                                                                                                                                                                                                                                                                      | In general, he correctly understands the current industry stand-                                                                                                                                                                                                                                                                                                                                  | Perfectly understands the current industry standards that determine the requirements for                                                                                                                                                                                                                                                                                                |

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|                                                      |                                                                            | standards that determine the requirements for the parameters of equipment, channels and paths; methods for checking the technical condition of equipment, paths and transmission channels.                                                                                                                                     | ards that determine the requirements for the parameters of the operation of equipment, channels and paths; methods for checking the technical condition of equipment, paths and transmission channels. Makes minor mistakes.                                                                                                            | the parameters of the operation of equipment, channels and paths; methods for checking the technical condition of equipment, paths and transmission channels.                                                                                                                                                                       |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 PK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in compliance with the technologies for setting up, adjusting and testing communication (telecommunications) equipment, operating rules and methods of using measuring and testing equipment.                                                                                                                   | In general, correctly observes the technologies for setting up, adjusting and testing communication equipment (telecommunications), operating rules and methods of using measuring and testing equipment. Makes minor mistakes.                                                                                                         | Accurately and reasonably observes the technologies for setting up, adjusting and testing communication (telecommunications) equipment, operating rules and methods of using measuring and testing equipment.                                                                                                                       |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 PK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when making adjustments, adjustments and tests of communication equipment (telecommunications) using technical and technological documentation; maintaining technical and technological documentation in accordance with the established forms; checking the quality of equipment and communication facilities. | Confidently performs settings, adjustments and tests of communication equipment (telecommunications) using technical and technological documentation; maintains technical and technological documentation in accordance with the established forms; checks the quality of equipment and communication facilities. Makes minor mistakes. | Competently and independently performs settings, adjustments and tests of communication equipment (telecommunications) using technical and technological documentation; maintains technical and technological documentation in accordance with the established forms; checks the quality of equipment and communication facilities. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-4 PK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes during the incoming inspection of equipment, preparation of testing equipment,                                                                                                                                                                                                                                  | Basically, correctly conducts incoming inspection of equipment, preparation of testing equipment,                                                                                                                                                                                                                                       | Perfectly conducts incoming inspection of equipment, preparation of test equipment,                                                                                                                                                                                                                                                 |

|                                                      |                                                                            |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                       |
|------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                      |                                                                            | measuring equipment, devices; testing equipment and working out the operating modes of the equipment.                                                                                                                                                         | measuring equipment, devices; testing of equipment and development of equipment operating modes. Makes minor mistakes.                                                                                                                                                                         | measuring equipment, devices; testing of equipment and development of equipment operating modes.                                                                                                                                                      |
| Learning outcomes:<br><i>Indicator:</i><br>ID-5 PK-5 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the selection and use of appropriate test and measuring equipment, the use of equipment software when setting it up.                                                                                                                        | Quite confidently selects and uses the appropriate test and measuring equipment, uses the equipment software when setting it up. Makes minor mistakes.                                                                                                                                         | Independently and competently selects and uses the appropriate test and measuring equipment, uses the equipment software when setting it up.                                                                                                          |
| <b>Competency: PK-6</b>                              |                                                                            |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                       |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 PK-6 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding the architecture and general principles of functioning, hardware, software and software and hardware of the administered network, the procedure for configuring network elements of the information and communication system. | In general, he correctly understands the architecture and general principles of the functioning of hardware, software and software and hardware of the administered network, the procedure for configuring network elements of the information and communication system. Makes minor mistakes. | Perfectly understands the architecture and general principles of functioning of hardware, software and software and hardware of the administered network, the procedure for configuring network elements of the information and communication system. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 PK-6 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when using modern standards when administering devices and software; using standard and external software and hardware to monitor the performance of the network infrastructure of the administered network.                                   | Basically, correctly uses modern standards when administering devices and software; uses standard and external software and hardware to monitor the performance of the network infrastructure of the administered network. Makes minor mistakes.                                               | Competently and independently uses modern standards in the administration of devices and software; uses standard and external software and hardware to monitor the performance of the network infrastructure of the administered network.             |

|                                                      |                                                                            |                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 PK-6 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when diagnosing failures and errors of network devices and software.                                                                                                                                                                                                                  | Confidently diagnoses failures and errors of network devices and software. Makes minor errors.                                                                                                                                                                                                                            | Diagnoses failures and errors of network devices and software with great efficiency.                                                                                                                                                                                                      |
| Learning outcomes:<br><i>Indicator:</i><br>ID-4 PK-6 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when carrying out routine maintenance on network devices and software of the infocommunication system.                                                                                                                                                                                | Quite confidently carries out routine maintenance on network devices and software of the information and communication system. Makes minor mistakes.                                                                                                                                                                      | Competently carries out routine maintenance on network devices and software of the information and communication system.                                                                                                                                                                  |
| Learning outcomes:<br><i>Indicator:</i><br>ID-5 PK-6 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in the installation and configuration of system and application software necessary for the functioning of the IS in accordance with the work assignment, the implementation of standard design and parameterization of the IS in accordance with the regulations of the organization. | Quite confidently performs the installation and configuration of system and application software necessary for the functioning of the IS in accordance with the work assignment, carries out standard design and parameterization of the IS in accordance with the regulations of the organization. Makes minor mistakes. | Competently performs installation and configuration of system and application software necessary for the functioning of the IS in accordance with the work assignment, carries out standard design and parameterization of the IS in accordance with the regulations of the organization. |
| <b>Competency: PK-7</b>                              |                                                                            |                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                           |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 PK-7 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding and using the basic principles, protocols and software cryptographic tools for ensuring the information security of network devices.                                                                                                                                 | Generally correctly understands and uses the basic principles, protocols and software cryptographic tools for ensuring the information security of network devices. Makes minor mistakes.                                                                                                                                 | Perfectly understands and uses the basic principles, protocols and software cryptographic tools for ensuring the information security of network devices.                                                                                                                                 |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 PK-7 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes in understanding the general principles of functioning and architecture of                                                                                                                                                                                                            | In general, he correctly understands the general principles of functioning and architecture of                                                                                                                                                                                                                            | Perfectly understands the general principles of operation and architecture of hardware,                                                                                                                                                                                                   |

|                                                      |                                                                            |                                                                                                                                                                                                   |                                                                                                                                                                                                                     |                                                                                                                                                                                                          |
|------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                      |                                                                            | hardware, software, software and hardware of the administered network; protocols of the channel, network, transport and application layers of the model of interaction of open systems.           | hardware, software, software and hardware of the administered network; protocols of the channel, network, transport and application layers of the model of interaction of open systems. Makes minor mistakes.       | software, software and hardware of the administered network; protocols of the channel, network, transport and application layers of the model of interaction of open systems.                            |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 PK-7 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when using software, hardware and software and hardware to protect network devices from unauthorized access; configuring the parameters of modern software and hardware firewalls. | Quite confidently applies software, hardware and software and hardware to protect network devices from unauthorized access; adjusts the parameters of modern software and hardware firewalls. Makes minor mistakes. | With great efficiency, it uses software, hardware and software and hardware means to protect network devices from unauthorized access; adjusts the parameters of modern software and hardware firewalls. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-4 PK-7 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when connecting and configuring modern remote access security tools (operating systems and specialized protocols); working with control and measuring hardware and software.       | Confidently connects and configures modern remote access security tools (operating systems and specialized protocols); works with control and measurement hardware and software. Makes minor mistakes.              | Competently connects and configures modern remote access security tools (operating systems and specialized protocols); effectively works with control and measurement hardware and software.             |
| Learning outcomes:<br><i>Indicator:</i><br>ID-5 PK-7 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when installing additional software products to ensure remote access security and parameterization.                                                                                | Generally correctly installs additional software products to ensure remote access security and parameterization. Makes minor errors.                                                                                | Competently and independently installs additional software products to ensure the security of remote access and their parameterization.                                                                  |
| <b>Competency: PK-8</b>                              |                                                                            |                                                                                                                                                                                                   |                                                                                                                                                                                                                     |                                                                                                                                                                                                          |
| Learning outcomes:<br><i>Indicator:</i><br>ID-1 PK-8 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when following the instructions for the installation                                                                                                                               | In general, correctly follows the instructions for the installation                                                                                                                                                 | Perfectly complies with the instructions for the installation and operation of the managed                                                                                                               |

|                                                      |                                                                            |                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                      |                                                                            | tion and operation of the managed network devices and software; the regulations for carrying out preventive maintenance on the administered information and communication system.                                                                                                                                                                | and operation of the administered network devices and software; the regulations for preventive maintenance on the administered information and communication system. Makes minor mistakes.                                                                                                                                                                   | network devices and software; the regulations for preventive maintenance on the administered information and communication system.                                                                                                                                                                                                                                          |
| Learning outcomes:<br><i>Indicator:</i><br>ID-2 PK-8 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when installing operating systems of network devices; monitoring of managed network devices; using standard data recovery procedures, working with archiving servers and operating system management tools; scheduling backup of operating systems of network devices; disassembling and assembling administered network devices. | Generally correctly installs the operating systems of network devices; monitors administered network devices; uses standard data recovery procedures, works with backup servers and operating system management tools; schedules backups of network device operating systems; disassembles and reassembles administered network devices. Makes minor errors. | Correctly and independently installs the operating systems of network devices; monitors the administered network devices; uses standard data recovery procedures, works with archiving servers and operating system management tools; draws up a backup schedule for the operating systems of network devices; disassembles and assembles the administered network devices. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-3 PK-8 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when using modern tools for monitoring the performance of the administered network; using regulatory and technical documentation in the field of information and communication technologies to solve problems.                                                                                                                    | Uses modern means of monitoring the performance of the administered network quite confidently; uses regulatory and technical documentation in the field of information and communication technologies to solve problems. Makes minor mistakes.                                                                                                               | Uses modern means of monitoring the performance of the administered network with great efficiency; uses regulatory and technical documentation in the field of information and communication technologies to solve problems.                                                                                                                                                |
| Learning outcomes:<br><i>Indicator:</i><br>ID-4 PK-8 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes when rebooting the operating systems of network devices, planning the schedule                                                                                                                                                                                                                                                    | In general, it correctly performs work on rebooting the operating systems of network devices,                                                                                                                                                                                                                                                                | Perfectly performs work on rebooting the operating systems of network devices, planning                                                                                                                                                                                                                                                                                     |

|                                                      |                                                                            |                                                                                                                                                                                            |                                                                                                                                                                                                                                      |                                                                                                                                                                                                          |
|------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                      |                                                                            | for copying the software of the network infocommunication system, restoring parameters using archiving servers and management tools of specialized operating systems of network equipment. | planning the schedule for copying the software of the network infocommunication system, restoring parameters using archiving servers and management tools of specialized operating systems of network equipment. Makes minor errors. | the schedule for copying the software of the network infocommunication system, restoring parameters using archiving servers and management tools for specialized operating systems of network equipment. |
| Learning outcomes:<br><i>Indicator:</i><br>ID-5 PK-8 | Unable to complete tasks related to this competency achievement indicator. | Makes mistakes during routine maintenance of equipment in accordance with the manufacturer's recommendations.                                                                              | In general, it correctly conducts routine maintenance of equipment in accordance with the manufacturer's recommendations. Makes minor mistakes.                                                                                      | With great efficiency, it carries out routine maintenance of equipment in accordance with the manufacturer's recommendations.                                                                            |

## 2.2 Criteria for assessing competencies at the state exam

When evaluating a student's answer at the state exam, the level of competence formation is taken into account according to the following proposed criteria:

- the ability to use theoretical and practical knowledge within a specialized part of a field.
- the ability to integrate knowledge from new or interdisciplinary fields for the exploratory diagnosis of problems,
- the ability to analyze and compare different approaches to solving the problem,
- the student's readiness to answer additional questions on the essence of the exam ticket.
- other requirements imposed by the fund of assessment tools for the final certification, developed by the graduating department.

The grade **"excellent"** is given to a student if the student has shown the presence of deep, exhaustive knowledge of all questions of the ticket; competent and logically harmonious construction of answers to the questions of the ticket and additional questions; demonstrated confident and correct answers to questions on the application of the acquired knowledge in professional activities.

As a rule, the grade "excellent" is given to students who have mastered the relationship of the basic concepts in their meaning for the acquired profession, who have shown creative abilities in understanding, presentation and use of educational material.

A grade **of "good"** is given to a student if the student has shown that he has solid and sufficiently complete knowledge of all the questions on the ticket; made minor errors in the answers, which caused comments and corrections from the commission members; demonstrated the correct answers to questions on the application of the acquired knowledge in networks and communication systems.

As a rule, the grade "good" is given to students who have shown the systematic nature of knowledge and are able to independently replenish and update it in the course of further educational work and professional activity.

A grade **of "satisfactory"** is given to a student if the student has shown solid knowledge of all questions on the ticket; presentation of answers to the questions on the ticket and additional questions with errors, confidently corrected after additional questions; the need for leading questions; demonstrated the correct answers to questions on the application of knowledge.

As a rule, the grade "satisfactory" is given to students who have made errors in the answer at the exam and in the performance of exam tasks, but have the necessary knowledge to eliminate them under the guidance of the teacher.

An **"unsatisfactory" grade** is given to a student if the student does not meet the requirements for a "satisfactory" grade.

## 2.3 Criteria for assessing competencies at the defense of the final qualification work / scientific report

*The criteria for assessing the level of competence to be defended are as follows.*

The grade **"excellent"** is given for the following work:

- a high level of relevance, independence and practical significance of the thesis;
- originality of solutions and novelty of the results obtained, personal contribution of the author;
- validity of results and conclusions from the standpoint of logic in the presentation and discussion of own data, their compliance with known scientific provisions and facts, the correctness of the use of research methods;
- use of a sufficient and necessary number of information sources, including electronic ones;
- the ability to concisely report on the work done, convincingly substantiate their judgments and conclusions, reason reasonably, fully and deeply answer the questions and comments of reviewers;
- impeccable quality of thesis design and presentation;

- positive feedback and review.

The grade "**good**" is given for the following work:

- medium level of relevance, independence and practical significance of the thesis;
- correctness of decisions and results obtained;
- validity of results and conclusions;
- use of a sufficient and necessary number of information sources, including electronic

ones;

- the ability to clearly report on the work done, substantiate their judgments and conclusions, reason, answer questions and comments of reviewers;
- good quality of thesis design and presentation;
- In general, positive feedback and reviews, but with some comments.

The grade "**satisfactory**" is given for the following work:

- the traditional nature of the topic, the low level of independence and practical significance of the thesis;
- insufficiency and/or disputability of individual decisions and/or results;
- the use of a small number of information sources, including electronic ones,
- acceptable quality of thesis registration, but with existing shortcomings,
- incompleteness of the report on the work done, insufficiently substantiated judgments and conclusions, errors in the construction of reasoning, superficial answers to the questions asked and comments of reviewers,
- review and review with comments.

The grade "**unsatisfactory**" is given for the following work:

- insufficient level of mastery of most competencies;
- does not know the content of the work, cannot comment on its elementary provisions;
- in the process of the report, makes gross mistakes in reasoning;
- incorrectly answers or does not answer leading and additional questions of the commission on the content of the thesis and the comments of the reviewers;
- low quality of work design;
- review and review with serious remarks.

Description of the grading scale

The maximum amount of points is set at **100** points and converted into a 5-point rating system in accordance with the scale:

The scale of correspondence of the rating score to the 5-point system:

| Rating Score | Score on a 5-point system |
|--------------|---------------------------|
| 88 – 100     | Excellent                 |
| 72 – 87      | Good                      |
| 53 – 71      | Satisfactory              |
| < 53         | Unsatisfactory            |

### 3. Standard control tasks or other materials necessary to assess the results of mastering the educational program of higher education

#### 3.1 Questions for the state exam

##### Questions to check the level of learning

##### 1. Computer Communications and Networking.

1. Fundamentals of network technologies: telecommunication network, circuit and packet switching, data flows, NGN networks, addressing.
2. Functions of EMVOS model levels.

3. Data encapsulation in the TCP/IP model.
4. Ethernet LANs.
5. Switches in local networks: algorithm of operation, switching modes.
6. ARP protocol.
7. VLANs.
8. The STP protocol.
9. IPv4 protocol: essence, packet structure.
10. IPv6 protocol: essence, packet structure.
11. Network IPv4 addresses.
12. Network IPv6 addresses.
13. Routers in network technologies. Routing principles.
14. RIP routing protocol.
15. OSPF routing protocol.
16. WAN Access Option: Private WAN Infrastructure, Advantages and Disadvantages.
17. WAN Access Option: Public WAN infrastructures, advantages and disadvantages.
18. ISDN technology.
19. Frame Relay technology.
20. ATM technology.

## **2. Digital Circuit and Logic Design.**

1. Classification of amplifiers. Main technical indicators and characteristics of the amplifier.
2. Principles of amplification of the electrical signal. Typical amplifier diagram.
3. Feedback in amplifiers.
4. Amplifying stage with a common emitter (with a common source).
5. Amplifying stages with a common base (gate) and with a common collector (drain).
6. Methods of increasing the gain factor. Low-frequency and high-frequency gain correction.
7. General information, parameters, characteristics, and equivalent op-amp diagram.
8. Circuits for switching on op-amps. Static errors of op-amps.
9. Voltage combiners, differentiators, and op-amp integrators.
10. Conditions and modes of self-excitation of generators. Generators with resonant circuits.
11. Basic logic gates: inverters; repeaters and buffers, AND, AND-NOT, OR, OR-not, Exclusive OR.
12. Combination schemes: decoders and encoders.
13. Combination circuits: multiplexers and adders.
14. Basics of construction and classification of triggers. Principle of operation of typical RS triggers, JK triggers and D-triggers.
15. Parallel registers triggered by the edge and by level, their application schemes.
16. Shift registers and schemes of their application.
17. Asynchronous counters and their application schemes.
18. Synchronous meters and their application schemes.
19. Read-only storage devices. Firmware machines on ROM.
20. RAM devices as an information buffer.

## **3. Object-Oriented Programming.**

1. What is encapsulation in object-oriented programming?
  - a) This is the ability of an object to hide its data from other objects
  - 2) It is the ability of an object to present data in the form of a graphical interface
  - 3) It is the ability of an object to store its data in a database
2. What is an abstract class in Python?

- a) A class that implements all methods
- 2) A class that only has methods, but no implementation for them
- 3) A class that has no methods
- 3) How can I create an instance of a class in Python?
  - 1) Using the `__init__()` function
  - 2) Using the `new` keyword
  - 3) By calling the class name and parentheses
- 3) Which of the following operators is used to define a class in Python?
  - a) `def`
  - 2) `class`
  - 3) `var`
  - 4) `object`
- 4) How do I create a class object in Python?
  - a) Using the `def` operator
  - 2) Using the `class` operator
  - 3) By calling the class name, e.g. `obj = MyClass()`
  - 4) You can't create a class object in Python
- 5) What is a constructor in Python?
  - a) A function that is called when a class object is created
  - 2) A function that is called when an object of the class is destroyed
  - 3) A function that executes when a class is initialized
  - 4) A function that performs a given action in response to a certain event
- 6) How do I add a new method to an existing class in Python?
  - 1) Change the code of the original class definition
  - 2) Use the `extend` operator
  - 3) Use the `def` operator
  - 4) You can't add a new method to an existing class
- 7) What is class inheritance in Python?
  - a) The process of creating a new class based on an existing class
  - 2) The process of creating a new object based on an existing object
  - 3) The process of creating a new variable based on an existing variable
  - 4) The process of creating a new feature based on an existing feature

### **Tasks to check the level of learning**

#### **Computer Communications and Networking.**

1. Configure the SSH protocol (file name 2.2.1.4 Packet Tracer - Configuring SSH.pka).
2. Configure the Switch Port Security function (file name 2.2.4.9 Packet Tracer - Configuring Switch Port Security.pka).
3. Troubleshoot switch port security (file name 2.2.4.10 Packet Tracer - Troubleshooting Switch Port Security.pka).
4. Troubleshoot the VLAN implementation. Option No1 (file name 3.2.4.7 Packet Tracer - Troubleshooting a VLAN Implementation - Scenario 1.pka).
5. Troubleshoot the VLAN implementation. Option No2 (file name 3.2.4.8 Packet Tracer - Troubleshooting a VLAN Implementation - Scenario 2.pka).
6. Configure the router interfaces. (file name 1.1.3.5 Packet Tracer - Configuring IPv4 and IPv6 Interfaces.pka).
7. Create and test a straight, unshielded "unshielded twisted pair" cable for an Ethernet network (T568A standard).
8. Create and test a crossed unshielded "unshielded twisted pair" cable for an Ethernet network (T568V standard).

9. Set a password on the control console and log in to privileged mode.
10. Set the enable secret password on the Cisco router.

### Digital Circuit and Logic Design.

Determine the number of identical stages of a multi-channel amplifier that provides a power gain of at least 1000 (in times), if one stage has a voltage gain of 26 dB and a current gain of 20 dB.

1. Determine the voltage gain of the first stage of a three-stage amplifier (in decibels and times) if the total gain is 80 dB, and the gain of the second stage is 6 dB more than the gain of the third stage, which is equal to 10 relative units (times).
2. Using the values of the measuring instruments in the diagram shown (see Fig. 1), determine the gain factors in terms of voltage, current, power and through-gain.

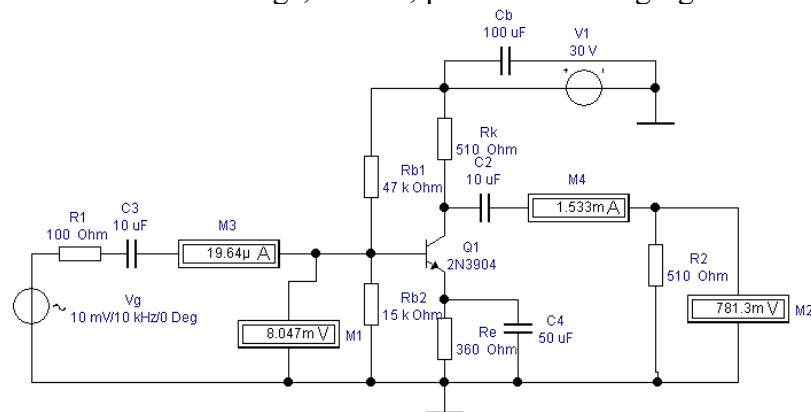


Fig. 1

3. Determine the type of amplifier and the purpose of all resistors and capacitors that are part of it (see Fig. 1).
4. To conduct a comparative analysis of amplifier stages with various bipolar transistor switching circuits, while revealing their advantages and disadvantages, indicating the scope of application.
5. Draw up and explain the operation of the LED indication control circuit on a logic inverter. Calculate the value of the resistance limiting the current through the LED, provided that the value of the current consumption of the LED should be at least 10 mA, but not more than 100 mA, and the voltage drop on the LED is 1 V.
6. Present a symbol, jump table, and time diagrams of a synchronous single-stage D trigger with dynamic write control and asynchronous preset inputs.
7. Make a diagram of a controlled inverter on the logic element "Exclusive OR", explain the principle of operation of a controlled inverter using a time diagram.
8. Draw up a diagram of a single-digit complete adder, explain its principles of construction and operation.
9. To substantiate the choice of the necessary microcircuits (element base) for the construction of a 16-bit accumulating adder from the provided list of microcircuits: K555AP6, K555IV2, K555ID6, K555IE17, K555IM6, K555IR9, K555IR35, K555KP17, K555LR13, K555TM8.

### Object-Oriented Programming.

1. What is encapsulation in object-oriented programming?
  - a) This is the ability of an object to hide its data from other objects
  - 2) It is the ability of an object to present data in the form of a graphical interface
  - 3) It is the ability of an object to store its data in a database
2. What is an abstract class in Python?

- a) A class that implements all methods
- 2) A class that only has methods, but no implementation for them
- 3) A class that has no methods
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  - 1) Using the `__init__()` function
  - 2) Using the `new` keyword
  - 3) By calling the class name and parentheses
- 3) Which of the following operators is used to define a class in Python?
  - a) `def`
  - 2) `class`
  - 3) `var`
  - 4) `object`
- 4) How do I create a class object in Python?
  - a) Using the `def` operator
  - 2) Using the `class` operator
  - 3) By calling the class name, e.g. `obj = MyClass()`
  - 4) You can't create a class object in Python
- 5) What is a constructor in Python?
  - a) A function that is called when a class object is created
  - 2) A function that is called when an object of the class is destroyed
  - 3) A function that executes when a class is initialized
  - 4) A function that performs a given action in response to a certain event
- 6) How do I add a new method to an existing class in Python?
  - 1) Change the code of the original class definition
  - 2) Use the `__extends__` operator
  - 3) Use the `def` operator
  - 4) You can't add a new method to an existing class
- 7) What is class inheritance in Python?
  - a) The process of creating a new class based on an existing class
  - 2) The process of creating a new object based on an existing object
  - 3) The process of creating a new variable based on an existing variable
  - 4) The process of creating a new feature based on an existing feature
- 8) Which of the following access modifiers in Python means that a class member is only available inside the class itself?
  - a) `public`
  - 2) `protected`
  - 3) `Private`
  - 4) `local`
- 9) What is polymorphism in object-oriented programming?
  - a) Ability to use different types of data in one variable
  - 2) Ability to create several objects of the same class
  - 3) Ability to create a new class based on an existing class
  - 4) The possibility of using the same method by different objects
- 10) What method is used to output information about a class object?
  - a) `repr()`
  - 2) `str()`
  - 3) `class()`
  - 4) `name()`

## 1. Computer Communications and Networking.

11. Basic switch setup. (file name 2.4.1.2 Packet Tracer - Skills Integration Challenge.pka).
12. Configure switch port security. (file name 2.3.1.2 Packet Tracer - Skills Integration Challenge.pka).
13. Configuring VLANs. (file name 3.2.1.7 Packet Tracer - Configuring VLANs.pka).
14. Configuring trunk channels. (file name 3.2.2.4 Packet Tracer - Configuring Trunks.pka).
15. Setting up and verifying a small network. (file name 1.1.4.5 Packet Tracer - Configuring and Verifying a Small Network.pka).
16. Configuring static and default IPv4 routes. (file name 2.2.2.4 Packet Tracer - Configuring IPv4 Static and Default Routes.pka).
17. Configuring static and default IPv6 routes. (file name 2.2.4.4 Packet Tracer - Configuring IPv6 Static and Default Routes.pka).
18. Configuring Floating Static Routes. (file name 2.2.5.5 Packet Tracer - Configuring Floating Static Routes.pka).
19. Troubleshooting static routes. (file name 2.3.2.3 Packet Tracer - Troubleshooting Static Routes.pka).
20. Setting up the RIPv2 protocol. (file name 3.2.1.8 Packet Tracer - Configuring RIPv2.pka).

## 2. Digital Circuit and Logic Design.

3. Determine the gain of the op-amp given in Fig. 2, calculate the depth of negative feedback and the width of the gain bandwidth, provided that with broken feedback, the frequency response meter showed the following parameters: gain - 106 dB, upper cutoff frequency - 50 Hz.

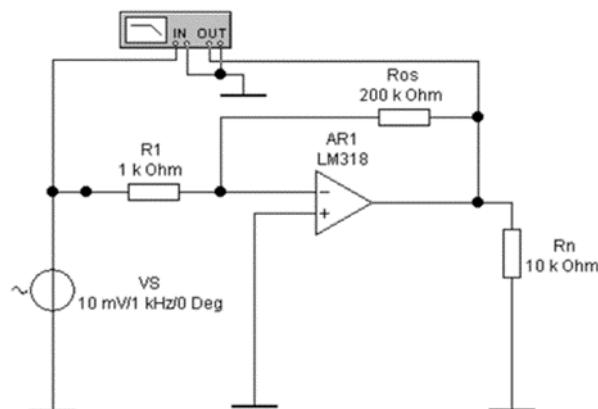


Fig. 2

1. Calculate the input impedance of the amplifier and the amplifier element (transistor) for the circuit shown in Fig. 3 using the measurement results and resistor resistance values.

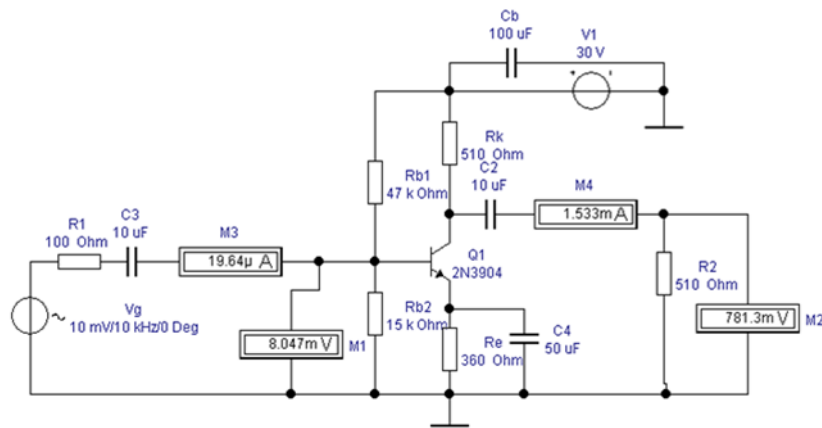


Fig. 3

2. Calculate the output impedance of the amplifier and the amplifier element (transistor) for the circuit shown in Fig. 3, using the measurement results and resistor resistance values, taking into account that the output voltage is 1.5 V in the no-load mode.
3. To develop a scheme of a controlled frequency divider on an asynchronous counter and a multiplexer, to explain the principle of operation.
4. Submit a proposal for the technical implementation of a four-channel single-bit multiplexer based on a decoder and logic gates.
5. Simulate a counter modulo 5 based on JK triggers and test its operation in the interactive Multisim emulator or in the Electronics Workbench schematic modeling package.
6. Simulate a frequency divider by 8 based on JK triggers and test its operation in the interactive Multisim emulator or in the Electronics Workbench schematic modeling package.
7. To develop a scheme of a 4-digit accumulating adder, to explain the principles of its construction and operation using time diagrams.
8. Make a diagram of a four-bit shift register on D triggers, explain its logic of operation using a time diagram.
9. To develop a scheme for the transmission of digital binary information in a serial code along two lines: information and synchronizing. To explain the procedure for its operation.

### Object-Oriented Programming.

1) Which of the following statements is used to define a class in Python?

- a) 4ef
- 2) 3lass
- 3) var
- 4) o2je3t

4. How do I create a class object in Python?

- a) Using the 4ef operator
- 2) Using the 3lass operator
- 3) By calling the class name, e.g. o2j = My3lass()
- 4) You can't create a class object in Python

5. What is a constructor in Python?

- a) A function that is called when a class object is created
- 2) A function that is called when an object of the class is destroyed
- 3) A function that executes when a class is initialized
- 4) A function that performs a given action in response to a certain event

6. How do I add a new method to an existing class in Python?

- 1) Change the code of the original class definition
- 2) Use the exten4s operator
- 3) Use the 4ef operator
- 4) You can't add a new method to an existing class

7. What is class inheritance in Python?

- a) The process of creating a new class based on an existing class
- 2) The process of creating a new object based on an existing object
- 3) The process of creating a new variable based on an existing variable
- 4) The process of creating a new feature based on an existing feature

### 3.2 Assessment tools for the final qualification work

#### 3.2.1 List of topics for graduation qualification works:

| №   | Topics of Graduation Qualification Works                                                                                                                                           |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | Development of the transmitting part of the stand for studying the attenuation of VHF radio waves when passing through various media.                                              |
| 2.  | Development of an NB-IoT wireless network based on the network structure of the mobile operator PJSC "VimpelCom".                                                                  |
| 3.  | Development of an antenna with spatial multiplexing for the 4G LTE standard.                                                                                                       |
| 4.  | Development of an AM signal SDR receiver based on the MATLAB/Simulink platform.                                                                                                    |
| 5.  | Development of an SDR receiver for an FM signal based on the MATLAB/Simulink platform.                                                                                             |
| 6.  | Development of a local computer network of the Federal State Budgetary Institution of Science Special Astrophysical Observatory of the Russian Academy of Sciences, Nizhny Arkhyz. |
| 7.  | Development of an infocommunication subsystem based on the Debian operating system for the joint venture "Vietsovpetro", Moscow                                                    |
| 8.  | Development of the receiving part of the stand for studying the attenuation of VHF radio waves when passing through various media.                                                 |
| 9.  | Development of the procedure for administering the information and communication system of the organization (based on the materials of Vera-SK LLC, Stavropol).                    |
| 10. | Development of an SDR-receiver of QPSK signal based on the MATLAB/Simulink platform.                                                                                               |
| 11. | Development of a fragment of the corporate network of Stomion LLC, Stavropol.                                                                                                      |
| 12. | Study of the optimal placement of the base station of the cellular communication system in the vicinity of the village of Sengeleevsky, Stavropol Territory.                       |
| 13. | Selection of the optimal architecture of the convolutional neural network of devices of the switching nodes of the communication network.                                          |
| 14. | Modernization of the telecommunication network of Stomion3D LLC based on the Windows Server 2019 remote desktop terminal server.                                                   |
| 15. | Development of a model for the functioning of a hybrid WDM communication system based on FSO technology.                                                                           |
| 16. | Development of a local computer network of BusinessInvetYug LLC based on Windows server 2019.                                                                                      |
| 17. | Development of a wireless two-level access control system to the protected area (integrated thesis).                                                                               |
| 18. | Design of a wireless communication network based on LTE for Concern Energomera JSC.                                                                                                |
| 19. | Development and study of algorithms for managing queues of network packets on the elements of the mobile communication system.                                                     |
| 20. | Development of a laboratory generator of discrete orthogonal signals (complex thesis).                                                                                             |
| 21. | Development of a simulation model of a wireless sensor network based on low-power                                                                                                  |

|     |                                                                                                                                                                |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | technologies.                                                                                                                                                  |
| 22. | Modernization of the mobile communication network of Unitel (Beeline Uzbekistan) LLC in the Juma district of Samarkand of the Republic of Uzbekistan.          |
| 23. | Development and research of the load balancing module data centers.                                                                                            |
| 24. | Design of an access network using FTTH technology in the Perspektivny microdistrict, Stavropol.                                                                |
| 25. | Design of a wireless communication network based on LTE technology for Stavropol-Auto Automobile Company LLC.                                                  |
| 26. | Modernization of the broadband access network of PJSC Mobile TeleSystems in Stavropol.                                                                         |
| 27. | Investigation of dispersion compensation processes in an optical communication channel based on SM-DCF technology.                                             |
| 28. | Development of recommendations for the design and technical diagnostics of an adaptive phased array antenna for mobile communication systems (integrated WRC). |

### 3.2.2 Structure of the work

#### Section 1. Analysis of the state of the problem to be solved

| Level of training | Task Statement                                                                                                                                                                                  | Controlled competencies or parts thereof |      |      |      |      |      |      |      |      |       |       |       |       |       |       |      |      |      |      |      |      |      |      |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|
|                   |                                                                                                                                                                                                 | UK-1                                     | UK-2 | UK-3 | UK-4 | UK-5 | UK-6 | UK-7 | UK-8 | UK-9 | UK-10 | OPK-1 | OPK-2 | OPK-3 | OPK-4 | OPK-5 | PK-1 | PK-2 | PK-3 | PP-4 | PP-5 | PP-6 | PP-7 | PP-8 |
| To know           | Task 1. To study the methodology for conducting a system analysis, the state of the field of knowledge and the formulation of the problems in it.                                               | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
|                   | Task 2. To study the methodology for conducting a system analysis of the works of previous researchers devoted to solving a specific problem and determining the ways they propose to solve it. | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
|                   | Task 3. To study the methodology for substantiating the subject of research.                                                                                                                    | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
|                   | Task 4. Study the methodology for writing a summary of the need for research.                                                                                                                   | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
| Be able to        | Task 1. Conduct a systematic analysis of the state of the field of knowledge and formulate the problems in it.                                                                                  | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
|                   | Task 2. To conduct a systematic analysis of the works of previous researchers devoted to the solution of a specific problem and to determine the ways they propose to solve it.                 | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
|                   | Task 3. To substantiate the subject of research.                                                                                                                                                | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
|                   | Task 4. Writing a summary of the need for research.                                                                                                                                             | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
| Own               | Task 1. To master the skills of conducting a systematic analysis of the state of the field of knowledge and formulating the problems available in it.                                           | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     | +    | +    | +    | +    | +    | +    | +    | +    |
|                   | Task 2. To master the skills of conducting a system analysis of the works of previous researchers devoted to solving a specific problem and determining the ways they propose to solve it.      | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     | +    | +    | +    | +    | +    | +    | +    | +    |
|                   | Task 3. To master the skills of substantiating the subject of research.                                                                                                                         | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     | +    | +    | +    | +    | +    | +    | +    | +    |

|  |                                                                            |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|--|----------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Task 4. Master the skills of writing a resume about the need for research. | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
|--|----------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Graphic material (if necessary).

## Section 2. Substantiation of ways to solve the problem

| Level of training | Task Statement                                                                                       | Controlled competencies or parts thereof |      |      |      |      |      |      |      |      |       |       |       |       |       |       |      |      |      |      |      |      |      |      |  |
|-------------------|------------------------------------------------------------------------------------------------------|------------------------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|--|
|                   |                                                                                                      | UK-1                                     | UK-2 | UK-3 | UK-4 | UK-5 | UK-6 | UK-7 | UK-8 | UK-9 | UK-10 | OPK-1 | OPK-2 | OPK-3 | OPK-4 | OPK-5 | PK-1 | PK-2 | PK-3 | PP-4 | PP-5 | PP-6 | PP-7 | PP-8 |  |
| To know           | Task 1. To study the method of dividing a specific problem into its component tasks.                 | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |  |
|                   | Task 2. To study the methodology for analyzing possible methods and algorithms for solving problems. | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |  |
|                   | Task 3. Study the rules for developing a general method for solving a problem.                       | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |  |
| Be able to        | Task 1. Divide a specific problem into its component tasks.                                          | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |  |
|                   | Task 2. Analyze possible methods and algorithms for solving problems.                                | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |  |
|                   | Task 3. Develop a general method for solving a problem.                                              | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |  |
| Own               | Task 1. To master the skills of dividing a specific problem into its component tasks.                | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     | +    | +    | +    | +    | +    | +    | +    | +    |  |
|                   | Task 2. To master the skills of analyzing possible methods and algorithms for solving problems.      | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     | +    | +    | +    | +    | +    | +    | +    | +    |  |
|                   | Task 3. Master the skills of developing a general method for solving a problem.                      | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     | +    | +    | +    | +    | +    | +    | +    | +    |  |

Graphic material (if necessary).

## Section 3. Verification and confirmation of the scientific provisions of the study

| Level of training | Task Statement                                                                                                                                                                                                                                                                                                    | Controlled competencies or parts thereof |      |      |      |      |      |      |      |      |       |       |       |       |       |       |      |      |      |      |      |      |      |      |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|
|                   |                                                                                                                                                                                                                                                                                                                   | UK-1                                     | UK-2 | UK-3 | UK-4 | UK-5 | UK-6 | UK-7 | UK-8 | UK-9 | UK-10 | OPK-1 | OPK-2 | OPK-3 | OPK-4 | OPK-5 | PK-1 | PK-2 | PK-3 | PP-4 | PP-5 | PP-6 | PP-7 | PP-8 |
| To know           | Task 1. To study the methodology for describing the calculations, experiments, experiments and data obtained in the course of the study.                                                                                                                                                                          | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
|                   | Task 2. To study the methodology for comparing the results obtained with the results of the studies of predecessors in order to confirm the reliability and novelty of the research performed. To study the methodology for analyzing the completeness of the solution of the tasks and the purpose of the study. | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
|                   | Task 3. To study the methodology for making proposals on the possibility of practical and scientific use of the results of solving the problem.                                                                                                                                                                   | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
| Be able to        | Task 1. Describe the calculations, experiments, experiments and data obtained during the study.                                                                                                                                                                                                                   | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
|                   | Task 2. Compare the results obtained with the results of the studies of predecessors in order to confirm the reliability and novelty of the research performed. Analyze the completeness of the solution of the tasks and the purpose of the study.                                                               | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
|                   | Task 3. Make proposals on the possibility of practical and scientific use of the results of solving the problem.                                                                                                                                                                                                  | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     |      |      |      |      |      |      |      |      |
| Own               | Task 1. Master the skills of describing calculations, experiments, experiments and data obtained in the course of the study.                                                                                                                                                                                      | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     | +    | +    | +    | +    | +    | +    | +    | +    |
|                   | Task 2. To master the skills of comparing the results obtained with the results of the research of predecessors in order to confirm the reliability and novelty of the research performed. To master the skills of analyzing the completeness of the solution of the tasks and the purpose of the study.          | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     | +    | +    | +    | +    | +    | +    | +    | +    |
|                   | Task 3. To master the skills of making sentences on the possibility of practical and scientific use of the results of solving a problem.                                                                                                                                                                          | +                                        | +    | +    | +    | +    | +    | +    | +    | +    | +     | +     | +     | +     | +     | +     | +    | +    | +    | +    | +    | +    | +    | +    |

#### **4. Methodological materials that determine the procedures for assessing the results of the development of the educational program**

##### **4.1 Methodological materials that determine the procedures for assessing the results of mastering the educational program at the state exam**

The exam procedure is carried out in accordance with the Regulation on the Procedure for Conducting State Final Certification for Educational Programs of Higher Education - Bachelor's Programs, Specialist Programs and Master's Programs - at NCFU.

The exam ticket includes two questions and two tasks. The first and second questions are to test knowledge for the basic level of training. The first task is to test skills, mastery of the material and practical skills for the basic level of training. The second task is to test skills, mastery of the material and practical skills for an advanced level of training.

Each student independently chooses an examination ticket once by means of arbitrary extraction. The ticket number is recorded by the secretary of the State Examination Commission in the appropriate protocol.

As a rule, a student is given up to 1 hour to prepare for answering the exam ticket.

When preparing, the student has the right to use the state exam program, as well as reference literature with the permission of the State Examination Commission

When checking the practical task, the following are evaluated: the sequence and rationality of execution, the accuracy of calculations, the correctness of the drawings.

##### **4.2 Methodological materials that determine the procedures for assessing the results of the development of the educational program at the defense of the final qualification work / scientific report**

At each stage, current control over the process of competence formation is carried out. The tasks offered to the student allow you to check universal (UK-1, UK-2, UK-3, UK-4, UK-5, UK-6, UK-7, UK-8, UK-9, UK-10), general professional (OPK-1, OPK-2, OPK-3, OPK-4, OPK-5), professional competencies (PK-1, PK-2, PK-3, PK-4, PK-5, PK-6, PK-7, PK-8).

When defending **the final qualification work**, the following are evaluated:

- 1) Work Type:
  - the work is not of an independent research nature;
  - the work is of an independent research nature;
  - The work is of a rationalization, inventive nature.
- 2) Relevance of the work:
  - the topic of the work is not relevant;
  - The topic of the work is relevant.
- 3) Goals and objectives of the work:
  - the goal and objectives are formulated incorrectly or do not correspond to the topic of the study;
  - goals and objectives are clearly and correctly formulated, correspond to the topic of research.
- 4) Scientific novelty:
  - the results of the study are not scientifically new;
  - new but insufficiently substantiated data have been obtained or new but insufficiently substantiated statements have been formulated;
  - new data have been obtained or new clearly justified statements have been formulated and proved.
- 5) Originality of the approach:
  - traditional topics of work;
  - the work is based on topics in new promising areas of science;
  - The work contains new ideas in promising areas of science.
- 6) Personal contribution of the author:

- the author's personal contribution to the study is insignificant;
  - the author's personal contribution is less than half of the content of the study;
  - the author's personal contribution is more than half of the content of the study;
  - The study was carried out by the author completely independently.
- 7) Practical significance:
- the work has no practical significance;
  - the work is partly of practical importance;
  - The work is interesting and has practical significance.
- 8) Theoretical significance:
- the work has no theoretical significance;
  - the work partially has theoretical significance;
  - The work is interesting and has theoretical significance.
- 9) Literature review on the topic:
- the review was rewritten from sources without independent analysis of the literature;
  - a thorough analysis of the literature was carried out;
  - generalization and analysis of literature data, their comparison with their own results are carried out.
- 10) Correspondence of topic and content:
- the content does not correspond to the formulated topic, goals and objectives;
  - the content does not always correspond to the formulated topic, goals and objectives;
  - the content exactly corresponds to the formulated topic, goals and objectives.
- 11) Research methodology:
- the choice of methods is incorrect;
  - the chosen methods are expedient, but simple and do not require sufficient time;
  - complex but universal techniques have been mastered;
  - existing methods have been modified or adapted;
  - Proprietary research methods have been developed.
- 12) Volume of analyzed material:
- the volume of the analyzed material is insignificant and does not allow to draw reliable conclusions;
  - the volume of the analyzed material is small, but allows you to draw reliable conclusions;
  - a large amount of analyzed material, which allows you to draw reliable conclusions.
- 13) Conclusions:
- the conclusions are unclear, vague, do not correspond to the tasks set or are unreliable;
  - the conclusions correspond to the tasks, but are too verbose or their reliability raises some doubts;
  - The conclusions are clearly formulated, reliable, based on the results obtained and correspond to the tasks set.
- 14) Quality of the design of the work:
- the work does not meet the requirements for the design of graduation papers;
  - the work is done accurately and meets most of the requirements for graduation works;
  - The work meets all the requirements for graduation works.
- 15) Language, style of presentation:
- the work is written in a simple colloquial style, contains errors and typos;
  - The work is written in scientific language, complies with the norms of the Russian literary language, is proofread, does not contain typos.
- 16) References:
- does not sufficiently reflect information on the topic of research, does not contain the works of leading scientists;

- sufficiently reflects information on the topic of research, but does not contain works in foreign languages;
- reflects information on the topic, contains the works of leading scientists, works published over the past five years, works in foreign languages.

17) Illustrative material:

- illustrative material is not sufficiently presented in the work;
- the work is well illustrated, drawings, graphs, schemes, diagrams, etc. are presented;
- The work is well illustrated, contains original author's drawings.

18) Report:

- the report is not logical, incorrectly structured, does not reflect the essence of the work;
- the report reflects the essence of the work, but has errors in the structure;
- The report is clearly structured, logical, and fully reflects the essence of the work.

19) Protection:

- speech is confused, not clear, the speaker does not refer to the slides of the presentation, does not fit into the time limit;
- the speech is clear, the time limit is met, the speaker refers to the slides of the presentation, but does not comment on them enough;
- The report is presented clearly, the speaker links the text of the report well with the slides of the presentation, actively comments on them.

20) Presentation:

- does not contain all the mandatory components, the background interferes with perception, there is a lot of unnecessary text, contains large tables, illustrative material is insufficient;
- contains all the mandatory components, but there are some drawbacks;
- the text is difficult to read, illustrative material without headings or captions, data, etc.;
- Meets all presentation requirements.

21) Answers to questions:

- cannot answer questions;
- answers to most of the questions are given;
- Exhaustive answers to all questions are given.