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Информация о владельце:
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MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution
Higher Education
"NORTH CAUCASUS FEDERAL UNIVERSITY"

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

FUND OF ASSESSMENT TOOLS
for current monitoring of progress and intermediate certification
by discipline
Circuit Analysis

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
Implemented in a semester	3

Introduction

1. Purpose

The fund of assessment tools for the discipline "Chain Analysis" is intended for an objective assessment of the level of competence formation.

2. FOS is an appendix to the program of the discipline "Circuit Analysis".

3. Developer V.I. Nikulin, Associate Professor of the Department of Digital, Robotic Systems and Electronics of the Institute of Advanced Engineering.

4. An examination of the FOC was carried out.

Members of the expert group:

Chairman: V.P. Mochalov, Professor of the Department of Digital, Robotic Systems and Electronics of the Institute of Advanced Engineering.

Members of the Commission:

S.V. Yakovlev, Associate Professor of the Department of Digital, Robotic Systems and Electronics of the Institute of Advanced Engineering.

S.V. Melnikov, Senior Researcher of the Interdisciplinary Training and Research Center for Agricultural Technologies, Associate Professor of the Department of Digital, Robotic Systems and Electronics of the Institute of Advanced Engineering.

Representative of the employer's organization:

Mironov V.A., General Director of Orintex LLC.

Expert opinion: The FAT for the discipline allows you to assess the level of competence formation. Start approbation.

5. The validity period of the FAT is determined by the period of implementation of the educational program.

1. List of competencies with an indication of the stages of their formation in the process of mastering the educational program

Code of the competency being assessed, indicator(s)	The stage of competence formation (No topics) <i>(in accordance with the work program of the discipline)</i>	Assessment Tools and Technologies	Type of control, certification <i>(current/intermediate)</i>	Type of control <i>(oral, written or with the use of technical means)</i>	Name of the Valuation Tool
Semester 3					
OPK-1 ID-1OPK-1 ID-2 _{OPK-1} ID-3 _{OPK-1} OPK-2 ID-1OPK-2 ID-2OPK-2 ID-3OPK-2 ID-4OPK-2 ID-5OPK-2 OPK-4 ID-2OPK-4	Topics No 1–16	Interview, Evaluation of answers to the questions of the given topics	Current	Oral	Interview Questions
OPK-1 ID-1OPK-1 ID-2 _{OPK-1} ID-3 _{OPK-1} OPK-2 ID-1OPK-2 ID-2OPK-2 ID-3OPK-2 ID-4OPK-2 ID-5OPK-2 OPK-4 ID-2OPK-4	Topics No 1–16	Testing with the help of computer-based test tasks	Current	with the use of technical means	computer-based test tasks
OPK-1 ID-1OPK-1 ID-2 _{OPK-1} ID-3 _{OPK-1} OPK-2 ID-1OPK-2 ID-2OPK-2 ID-3OPK-2 ID-4OPK-2 ID-5OPK-2 OPK-4 ID-2OPK-4	Topics No 1–4, 6, 8–11	Test task (checkpoint), performance of individual (group) tasks from laboratory work	Current	Written	A set of multi-level tasks
OPK-1 ID-1OPK-1 ID-2 _{OPK-1} ID-3 _{OPK-1} OPK-2 ID-1OPK-2	Topics No 4–16	Defense of the course project	Intermediate	Written/Oral	Assessment tools for a course project

ID-2OPK-2 ID-3OPK-2 ID-4OPK-2 ID-5OPK-2 OPK-4 ID-2OPK-4					
OPK-1 ID-1OPK-1 ID-2 _{OPK-1} ID-3 _{OPK-1} OPK-2 ID-1OPK-2 ID-2OPK-2 ID-3OPK-2 ID-4OPK-2 ID-5OPK-2 OPK-4 ID-2OPK-4	Topics No 1–16	Assessment of knowledge of exam questions	Intermediate	Oral	Questions for the exam

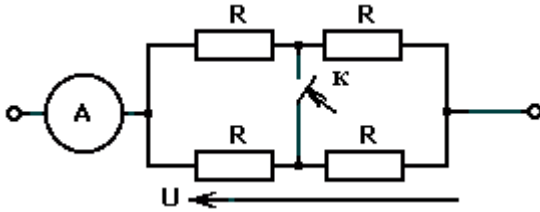
2. Description of indicators and assessment criteria at various stages of their formation, description of assessment scales

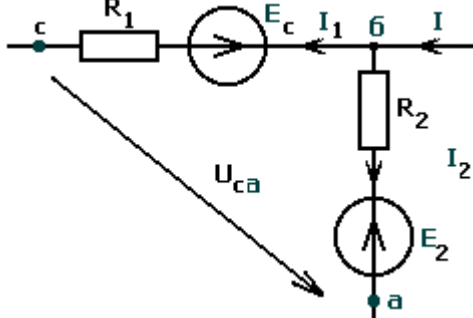
Levels of competence and indicators	Descriptors			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactory) 3 points	Intermediate level (good) 4 points	High level (excellent) 5 points
Competency: OPK-1				
ID-1 OPK-1 knows the fundamental laws of nature and the basic physical mathematical laws and methods of accumulating, transmitting and processing information.	Unable to complete tasks related to this competency achievement indicator	Performs tasks at the reproductive level related to this indicator of competence achievement	Performs tasks related to this indicator of competence achievement in standard situations, making minor mistakes	Fully performs tasks related to this indicator of competence achievement, including in non-standard situations
ID-2 OPK-1 is able to apply physical laws and mathematical methods to solve problems of a theoretical and applied nature.	Unable to complete tasks related to this competency achievement indicator	Performs tasks at the reproductive level related to this indicator of competence achievement	Performs tasks related to this indicator of competence achievement in standard situations, making minor mistakes	Fully performs tasks related to this indicator of competence achievement, including in non-standard situations
ID-3 OPK-1 has the skills to use knowledge of physics and mathematics in solving practical problems.	Unable to complete tasks related to this competency achievement indicator	Performs tasks at the reproductive level related to this indicator of competence achievement	Performs tasks related to this indicator of competence achievement in standard situations, making minor mistakes	Fully performs tasks related to this indicator of competence achievement, including in non-standard situations
Competency: OPK-2				

ID-1 _{OPK-2} finds and critically analyzes the information necessary to solve the problem	Unable to complete tasks related to this competency achievement indicator	Performs tasks at the reproductive level related to this indicator of competence achievement	Performs tasks related to this indicator of competence achievement in standard situations, making minor mistakes	Fully performs tasks related to this indicator of competence achievement, including in non-standard situations
ID-2 _{OPK-2} develops a solution to a specific problem, choosing the best option, evaluating its advantages and disadvantages.	Unable to complete tasks related to this competency achievement indicator	Performs tasks at the reproductive level related to this indicator of competence achievement	Performs tasks related to this indicator of competence achievement in standard situations, making minor mistakes	Fully performs tasks related to this indicator of competence achievement, including in non-standard situations
ID-3 _{OPK-2} knows the basic methods and means of conducting experimental research, standardization and certification systems.	Unable to complete tasks related to this competency achievement indicator	Performs tasks at the reproductive level related to this indicator of competence achievement	Performs tasks related to this indicator of competence achievement in standard situations, making minor mistakes	Fully performs tasks related to this indicator of competence achievement, including in non-standard situations
ID-4 _{OPK-2} is able to select methods and means of measurement and conduct experimental research.	Unable to complete tasks related to this competency achievement indicator	Performs tasks at the reproductive level related to this indicator of competence achievement	Performs tasks related to this indicator of competence achievement in standard situations, making minor mistakes	Fully performs tasks related to this indicator of competence achievement, including in non-standard situations
ID-5 _{OPK-2} is proficient in the methods of processing and presenting the data obtained and assessing the error of measurement results.	Unable to complete tasks related to this competency achievement indicator	Performs tasks at the reproductive level related to this indicator of competence achievement	Performs tasks related to this indicator of competence achievement in standard situations, making minor mistakes	Fully performs tasks related to this indicator of competence achievement, including in non-standard situations
Competency: OPK-4				
ID-2 _{OPK-4} designs a solution to a specific project task, choosing the best way to solve it, based on the current legal norms and available resources and restrictions.	Cannot perform tasks related to this indicator of competence achievement	Performs tasks at the reproductive level related to this indicator of competence achievement	Performs tasks related to this indicator of competence achievement in standard situations, making minor mistakes	Fully performs tasks related to this indicator of competence achievement, including in non-standard situations

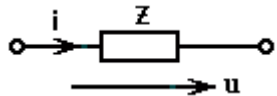
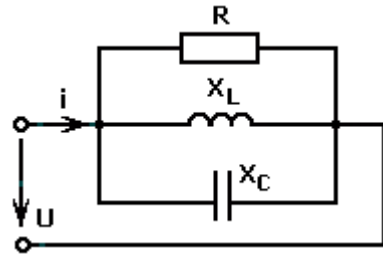
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TOOLS FOR CHECKING THE LEVEL OF COMPETENCE FORMATION

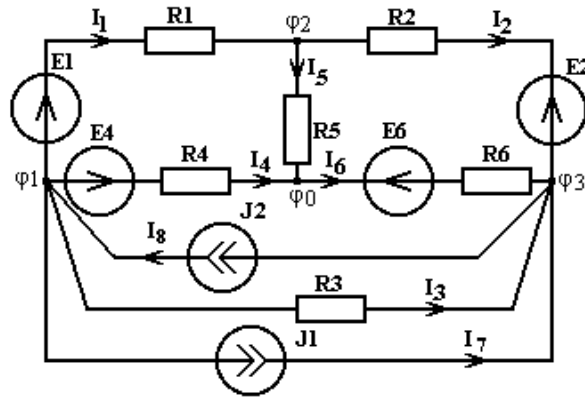
Job Number	Correct answer	Content of the question	Competence	Time to complete the task
1.		If the voltage is constant, then the ammeter reading after the key K is closed  a) will be halved (b) Remains unchanged (c) Will quadruple (d) Will be doubled	OPK-1	2 min
2.		The currents in the branches at $E1 = 100 \text{ V}$, $E2 = 130 \text{ V}$, $I = 8\text{A}$, $R1 = 3 \text{ Ohm}$, $R2 = 5 \text{ Ohm}$, $Uca = 70 \text{ V}$ of a complex circuit are equal to	OPK-1	5 min

		 a) $I_1 = 2, I_2 = 10$ b) $I_1 = 0, I_2 = 8A$ c) $I_1 = 10, I_2 = 2A$ d) $I_1 = 17,5, I_2 = 9,5A$		
3.		A circuit with $R = 10 \Omega$ and $C = 318 \mu F$ is connected in series with a voltage of $u = 71 \sin 314t$ V. Determine the instantaneous value of the voltage on the capacitance .	OPK-1	5 min
4.		Determine the resonant frequency, Q-factor and bandwidth of a series oscillating circuit with the parameters $R = 5 \text{ Ohm}$, $L = 10 \mu H$, $C = 4 \text{ nF}$.	OPK-1	5 min
5.		To determine how the bandwidth of a series oscillating circuit changes if an equal resistance is connected in parallel to the loss resistance R ?	OPK-1	5 min
6.		Determine the resonant frequency, Q-factor, and bandwidth of a parallel oscillating circuit with the parameters $R = 5 \text{ Ohm}$, $L = 10 \mu H$, $C = 4 \text{ nF}$.	OPK-1	10 min
7.		For the III circuit, write the equation according to Kirchhoff's law 2	OPK-1	10 min

8.		Given: $R_1=6\ \Omega$, $R_2=9\ \Omega$, $E=45\text{ V}$. Determine the parameters (E_e and R_e) of an equivalent voltage generator a) $E_e = 45\text{ V}$, $R_e = 9\ \Omega$ b) $E_e = 18\text{ V}$, $R_e = 3.6\ \Omega$ c) $E_e = 72\text{ V}$, $R_e = 15\ \Omega$ d) $E_e = 72\text{ V}$, $R_e = 3.6\ \Omega$ e) $E_e = 0\text{ V}$, $R_e = 6\ \Omega$	OPK-2	10 min
9.		In a circuit with a series connection, $R=10\ \Omega$ $X_L=40\ \Omega$, the voltage across the inductive element $u_L(t) = 240\sin(314t + 150^\circ)$ is B. What is the instantaneous value of the voltage applied to the circuit $u(t)$? $\therefore u(t) = 480\sin(314t + 150^\circ)\text{ V}$	OPK-2	10 min

		(a) $u(t) = 340\sin(314t - 105^\circ)$ B (b) $u(t) = 680\sin(314t + 195^\circ)$ B (c) $u(t) = 480\sin(314t)$ B (d) $u(t) = 240$ B		
10.		Write the expression of the instantaneous current obtained by adding two sinusoidal currents $i_1(t) = 3\sin(\omega t)$ and $i_2(t) = 3\sin(\omega t + 90^\circ)$	OPK-2	5 min
11.		Determine active and reactive power if sine current $i(t) = 4\sin(\omega t - 45^\circ)$ And tension $u(t) = 100\sin(\omega t - 45^\circ)$ In, 	OPK-2	2 min
12.		Determine the current in the unbranched part of the circuit, if the applied voltage $u = 120\sqrt{2}\sin\omega t$ B and $R = 12\ \Omega$, $X_L = 6\ \Omega$, $X_C = 12\ \Omega$, 	OPK-2	2 min
13.		The limiting frequencies of the serial oscillating loop bandwidth are 500 kHz and 320 kHz. Determine the frequency at which the voltage across the inductive element will have the maximum value.	OPK-2	2 min
14.		How will the Q-factor of a parallel oscillating circuit change if the capacitance of the circuit is reduced and the inductance is increased by a factor of 3?	OPK-2	5 min
15.		A parallel lossless oscillating circuit with an inductance of $L = 1\text{ mH}$ and capacitance $C = 4\text{ nF}$ is shunted with a resistor $R = 50\text{ k}\Omega$. To determine	OPK-2	10 min

		the ratio of the current in the inductive element to the total supply current of the circuit during resonance		
16.		Draw up a scheme for an experimental study of the 1st order LF frequency response and test its operation in the Multisim interactive emulator or in the Electronics Workbench schematic modeling package	OPK-2	5 min
17.		For node 1, write down the equation according to Kirchhoff's law 1 a) $-I1 - I3 - I4 = 0$ b) $-I1 - I3 + I4 = 0$ c) $-I1 + I3 + I4 = 0$ d) $I1 - I3 + I5 = 0$ e) $I1 - I2 + I5 = 0$	OPK-4	3 min
18.		For node 1, write down the equation of nodal potentials, taking 0 as the basis node.	OPK-4	5 min



$$\text{a) } \left(\frac{1}{R_1} + \frac{1}{R_3} + \frac{1}{R_4} \right) \varphi_1 + \frac{1}{R_1} \varphi_2 + \frac{1}{R_3} \varphi_3 = -E_1 \frac{1}{R_1} - E_4 \frac{1}{R_4} - J_1 + J_2.$$

$$\text{b) } \left(\frac{1}{R_1} + \frac{1}{R_3} + \frac{1}{R_4} \right) \varphi_1 - \frac{1}{R_1} \varphi_2 - \frac{1}{R_3} \varphi_3 = +E_1 \frac{1}{R_1} + E_4 \frac{1}{R_4} - J_1 + J_2.$$

$$\text{c) } \left(\frac{1}{R_1} + \frac{1}{R_3} + \frac{1}{R_4} \right) \varphi_1 - \frac{1}{R_1} \varphi_2 - \frac{1}{R_3} \varphi_3 = -E_1 \frac{1}{R_1} - E_4 \frac{1}{R_4} - J_1 + J_2.$$

$$\text{d) } \left(\frac{1}{R_1} + \frac{1}{R_3} + \frac{1}{R_4} \right) \varphi_1 - \frac{1}{R_1} \varphi_2 - \frac{1}{R_3} \varphi_3 = E_1 \frac{1}{R_1} - E_4 \frac{1}{R_4} + J_1 + J_2.$$

$$\text{e) } - \left(\frac{1}{R_1} + \frac{1}{R_3} + \frac{1}{R_4} \right) \varphi_1 - \frac{1}{R_1} \varphi_2 - \frac{1}{R_3} \varphi_3 = E_1 \frac{1}{R_1} + E_4 \frac{1}{R_4} + J_1 + J_2.$$

19.		Make a diagram of an experimental study of the frequency response of the 1st order RF link and test its operation in the interactive Multisim emulator or in the Electronics Workbench schematic modeling package	OPK-4	10 min
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20.		Draw up a diagram of an experimental study of the frequency response of the strip link and test its operation in the interactive Multisim emulator or in the Electronics Workbench schematic modeling package	OPK-4	10 min
21.		Draw up a scheme for an experimental study of the frequency response of a series oscillating circuit and test its operation in the interactive Multisim emulator or in the Electronics Workbench schematic modeling package	OPK-4	10 min
22.		Create a scheme for an experimental study of the transient response of a 1st order link and test its operation in an interactive Multisim emulator or in the Electronics Workbench schematic modeling package	OPK-4	10 min
23.		Schematic an experimental study of the RF transient response of the 1st order and test its operation in the interactive Multisim emulator or in the Electronics Workbench schematic modeling package	OPK-4	5 min
24.		Schematic an experimental study of the transient response of a strip link and test its operation in the interactive Multisim emulator or in the Electronics Workbench schematic modeling package	OPK-4	5 min

