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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

DISCIPLINE ASSESSMENT TOOLS FUND
"High Frequency Electronic Circuit"

Field of study	11.03.02 Infocommunication Technologies and Communication Systems
Profile	Intelligent Data Processing in Infocommunication Systems and Networks
Year of start of training	Oct. 2026
Form of study	Full-time
Implemented in a semester	5

Introduction

1. Purpose

The fund of assessment tools for the discipline "High Frequency Electronic Circuit" is designed to objectively assess the level of competence formation.

2.FOS is an appendix to the program of the discipline "High Frequency Electronic Circuit"

3. The developer is A.V. Bazhenov, 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: N.Y. Bratchenko, Chairman of the CMT of the Institute of Advanced Engineering, Associate Professor of the Department of Digital, Robotic Systems and Electronics of the Institute of Advanced Engineering.

Members of the Commission:

V.P. Mochalov, 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. Description of the criteria for assessing competence at various stages of their formation, description of assessment scales

Competencies, indicators	Levels of competence formation,			
	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 understands the fundamental laws of nature and the basic physical mathematical laws and methods of accumulating, transmitting and processing information.	Cannot analyze the statistics of the main indicators of the effectiveness of the use of microprocessor technology in infocommunications	Able to analyze the statistics of the main indicators of the effectiveness of the use of microprocessor technology in infocommunications at the reproductive level	Analyzes the statistics of the main indicators of the effectiveness of the use of microprocessor technology in infocommunications for typical conditions	Able to fully analyze the statistics of the main indicators of the effectiveness of the use of microprocessor technology in infocommunications, including in non-standard situations
ID-2 OPK-1 applies physical laws and mathematical methods to solve problems of a theoretical and applied nature.	Cannot develop schemes for the organization of communication and integration of new network elements, does not build and expand the switching subsystem using microprocessor technology.	At the reproductive level, he is able to develop schemes for the organization of communication and integration of new network elements, to build and expand a switching subsystem using microprocessor technology.	Develops schemes for the organization of communication and integration of new network elements, builds and expands the switching subsystem using microprocessor technology in typical operating conditions	Is able to develop schemes for the organization of communication and integration of new network elements, to build and expand a switching subsystem using microprocessor technology, including in non-standard situations
ID-3 OPK-1 uses knowledge of physics and mathematics to solve practical problems	Does not use knowledge of physics and mathematics in solving practical problems. Cannot develop schemes for the organization of communication and integration of new network elements, does not build and	At the reproductive level, he is able to develop schemes for the organization of communication and integration of new network elements, to build and expand a switching subsystem using microprocessor technology.	Develops schemes for the organization of communication and integration of new network elements, builds and expands the switching subsystem using microprocessor technology in typical operating conditions.	Is able to develop schemes for the organization of communication and integration of new network elements, to build and expand a switching subsystem

	expand a switching subsystem using microprocessor technology.			using microprocess or technology, including in non-standard situations

Assessment of the level of competence in the discipline is carried out on the basis of the "Regulation on the current monitoring of progress and intermediate certification of students in educational programs of higher education - bachelor's programs, specialist programs, master's programs - in the Federal State Autonomous Educational Institution of Higher Education "North Caucasus Federal University" in the current edition.

ASSESSMENT TOOLS TO CHECK THE LEVEL OF FORMATION OF COMPETENCIES

Job Number	Correct answer	Content of the question	Competence
		Form of study: Part-time Semester 8	
1.	a)	The modes of operation of eight-bit timer-counters T0, T2 are determined: a) the state of the WGMn2:WGMn0 bits of the TCCRn control register; b) the state of the COMnA1:COMnA0 bits of the TCNTn counting register; c) the state of the bits COMnA1:COMnA0 of the OCRn comparison register; d) the state of the bits FOCnA:FOCnB of the TCCRn control register;	OPK -1
2.	b)	ISP microcontrollers are characterized by: a) High speed of the arithmetic-logical device b) Ability to change the program without removing it from the device diagram c) The presence of additional parallel I/O ports	OPK -1
3.	a) c)	Let all the pins PB0... PB7 of the ATmega16x/32x microcontroller be used as inputs. They are connected to buttons that are connected to the +5V power rail by other pins. What will be in the PinB register when all the buttons are pressed? What should the DDRB register contain in this case? Select the correct statements. a) the number 0b11111111 will be in the PinB register b) the number 0b00000000 will be in the PinB register c) the DDRB register will contain the number 0b00000000 d) the DDRB register will contain the number 0b11111111	OPK -1
4.	a)	Choose the correct statements: a) the SREG register contains a set of flags indicating the current state of the microcontroller b) the SREG register is used to connect external RAM c) the SREG register contains the address of the byte to be sent over the SPI interface d) the SREG register stores the value of global variables	OPK -1
5.	a) b)	Direct addressing for data access in the AVR microcontrollers of the mega family is divided into:	OPK -1

	c) d)	a) direct addressing of one Rn b) direct addressing of two Rn c) direct addressing of Rn d) direct addressing of RAM e) direct addressing with index case; f) direct indirect addressing;	
6.	a)	The command counter is: a) a register that contains the address of the next executable instruction b) a counter that contains the number of executed program commands; c) a register that contains the total number of instructions in the program; e) a register that contains the total number of conditional jump instructions in the program;	OPK -1
7.	c)	The stack in mega microcontrollers is located in: a) non-volatile data memory b) program memory; c) RAM	OPK -1
8.	a)	Internal load resistor connected to the microcontroller port pin: a) creates an outflow current for external devices connected between the port pin and the common wire b) creates an outflowing current at the port terminal c) reduces the voltage on the port pin d) increases the voltage at the port pin	OPK -1
9.	a)	Choose the correct statement: a) the smaller the interrupt address in the interrupt table, the higher the interrupt priority b) the larger the interrupt address in the interrupt table, the higher the interrupt priority; c) the smaller the interrupt address in the interrupt table, the lower the interrupt priority; d) the larger the interrupt address in the interrupt table, the greater the interrupt priority;	OPK -1
10.	c)	A watchdog timer in mega microcontrollers is required for: a) to generate an interrupt if the contents of the counting register coincide with the contents of the watchdog	OPK -1

		b) to generate an interrupt if the contents of the comparison register match the contents of the watchdog c) protection of the microcontroller from freezing and failures in the process of operation	
11.		General characteristics of the microcontroller instruction system	OPK -1
12.		Define the concept of "microcontroller"	OPK -1
13.		Sequence of stages in the development of communication schemes, new network elements, switching subsystems and network platforms based on microprocessors	OPK -1
14.		Operand Addressing Methods	OPK -1
15.		Configuring Port Modes	OPK -1
16.		Control of the process of input/output of binary signals	OPK -1
17.		Organization of calculations according to a given time chart	OPK -1
18.		Organization of the computational process by events	OPK -1
19.		Organization of the computing process using a real-time operating system	OPK -1
20.		Purpose and Procedure for Generating Pulse Width Modulation Signals	OPK -1
21.		Purpose of the analog comparator	OPK -1
22.		Analog-to-digital conversions in microcontrollers	OPK -1
23.		Organization of information exchange using standard interfaces	OPK -1
24.		General characteristics of the universal synchronous-asynchronous transceiver	OPK -1
25.		Implementation of RS232 and RS485 interfaces based on built-in USART	OPK -1
26.	a) c)	The registered memory of the AVR family of microcontrollers includes (a) 32 general-purpose registers b) 64 general-purpose registers; c) the area of additional I/O registers d) static RAM registers;	OPK -1
27.	a) b)	Serial TWI a) has an SCL synchronization line b) has an SDA data line c) has an SDC command line d) has an SDA address line	OPK -1
28.	a) b)	When transmitting data via TWI: a) each bit transmitted is accompanied by a pulse on the SCL clock line	OPK -1

		b) the signal on the SDA line must be stable as long as the log signal is present on the SCL bus. 1 c) The signal on the SDA line must be stable as long as the log signal is present on the SCL bus. 0 (d) Each bit transmitted is accompanied by a logic high signal on the SCL clock line	
29.	a) b) c)	The following registers are used to control the USART module in the mega AVR microcontrollers: a) UCSR0A b) UCSR0B c) UCSR0C d) UCSOCRA e) UCSOCRB (e) UCSOCRC	OPK -1
30.	a) c)	When transferring data using the USART module: (a) The data is recorded in the UDR transmitter data register b) data is sent from the shift register to the UDR transmitter data register (UDRn) c) data is sent from the UDR register (UDRn) to the transmitter shift register d) data is recorded in the transmitter's UDR shift register	OPK -1
31.	e) f) g)	Each port in AVR microcontrollers (MCUs) corresponds to the following registers: a) DDRx is a register in which the desired values "1" or "0" are recorded and which must be obtained on the corresponding MCU legs when assigning them as output b) PINx - Operating Direction Register - Input or Output c) TIMERx – Counting Output Register d) TIMERx – control register of the timer-counter e) PINx register contains the received data on the corresponding MC legs f) PORTx is a register in which the desired values "1" or "0" are written and which must be obtained on the corresponding legs of the MC when assigning them as output g) DDRx - Operating Direction Register - Input or Output	OPK -1
32.	a)	The entry rab>>1 means: a) shifting the bits of the RAB variable by 1 to the right b) shifting the bits of the RAB variable by 1 to the left c) Comparison of the last bit of the RAB variable with 1	OPK -1

		d) comparison of the first digit of the RAB variable with 1	
33.	a) b)	The ADC module can operate in the following modes: a) single transformation b) continuous transformation c) discrete transformation d) reset on coincidence e) Capture on coincidence	OPK -1
34.	a)	To configure the PD2 pin as an output, use the following command: a) DDRD = 1<<2; b) DDRD = 1<<2; c) DDRD = 1>>2; d) DDRD &= ~(1<<2); e) DDRD &= ~(1>>2); (e) DDRD = 1<<1; g) DDRD = 1<<2;	OPK -1
35.	d)	The watchdog control register is called: a) WDCR b) WDT c) WDTOI d) WDTCR e) WDTCOI	OPK -1
36.		Compare two kinds of microprocessor device architectures: CISC and RISC	OPK -1
37.		Purpose of a watchdog	OPK -1
38.		Tools for debugging and diagnosing microprocessor devices	OPK -1
39.		List the features of programming embedded microprocessor systems	OPK -1
40.		List the features of programming microprocessor systems	OPK -1
41.		Classification of microprocessor device architectures	OPK -1
42.		In compliance with the existing rules and standards for installation and testing , the design of a digital multimeter consisting of: - Input voltage potentiometric simulator; - LCD display 16×2 MT-16S2; - Input signal level indicator (logic probe).	OPK -1

43.		In compliance with the existing rules and standards for installation and testing, carry out the design of a microprocessor-based thermal stabilization system consisting of: - DS18B20 temperature sensor; - DC motor; - PWM modulator that controls engine speed depending on temperature; - a simulator for turning on an electric heater in the form of an LED indicator.	OPK -1
44.		In compliance with the existing rules and standards for installation and testing , design a microprocessor-based engine speed control system with a speed indication consisting of: - potentiometric rotation speed setter; - DC motor; - PWM of the modulator that controls the engine speed; - 16×2 MT-16S2 LCD display for RPM.	OPK -1
45.		In compliance with the existing rules and standards for installation and testing , design a microprocessor device for remote control and indication of the temperature of the object consisting of: - two microcontrollers placed on different Arduino Uno boards; - DS18B20 temperature sensor connected to the first microcontroller; - 16 ×2 MT-16S2 LCD display connected to the second microcontroller; - Data exchange channel between microcontrollers via the I2C interface.	OPK -1
46.		To design, in compliance with the existing rules and standards for installation and testing , an intelligent servo control system with an angular displacement indication consisting of: - potentiometric angular displacement preset; - servo; - 16×2 MT-16S2 LCD display for rotation angle display.	OPK -1
47.		In compliance with the existing rules and standards for installation and testing, the design of an ultrasonic distance meter consisting of: - ultrasonic emitter and ultrasonic signal receiver or potentiometric simulator; - LCD indicator 16×2 MT-16S2 for displaying the angle of rotation - PWM modulator that controls engine speed depending on temperature; - Sound detector for three range ranges.	OPK -1

48.		In compliance with the existing rules and standards for installation and testing, the design of an intelligent controller of the security system as part of - two normally open contact sensors; - two normally closed contact sensors; - sound annunciator; - a seven-segment indicator to display the number of the triggered contact.	OPK -1
49.		In compliance with the existing rules and standards for installation and testing , design a microprocessor device for remote control and indication of the temperature of the object consisting of: - a microcontroller located on the Arduino Uno board; - personal computer; - DS18B20 temperature sensor connected to the microcontroller; - USB/RS485/USART converter; - Data exchange channel between the microcontroller and the PC via the RS485 interface.	OPK -1
50.		General characteristics of One Wire, I2C, SPI, RS232 and RS485 interfaces	OPK -1

2. Description of the rating scale

Students' progress in each discipline is assessed during current control and intermediate certification.

3. Criteria for assessing competencies

An "excellent" grade is given to a student if he has deeply and firmly mastered the program material, exhaustively, consistently, clearly and logically presents it, is able to closely link theory with practice, freely copes with tasks and questions not only of the basic, but also advanced level, and does not find it difficult to answer when modifying the tasks, correctly justifies the decision made, has versatile skills and techniques for performing practical tasks.

A grade of "good" is given to a student if he knows the material firmly, presents it competently and to the point, avoiding significant inaccuracies in answering questions of the basic level, correctly applies theoretical provisions when solving practical issues and tasks of the basic level, has the necessary skills and techniques for their implementation.

A "satisfactory" grade is given to a student if he has knowledge of only the basic material of the basic level, but has not mastered its details, makes inaccuracies, insufficiently correct formulations, violations of the logical sequence in the presentation of the program material, has difficulties in solving problems of the basic level.

The grade "unsatisfactory" is given to a student who does not know a significant part of the program material, makes gross mistakes, and does not know how to solve practical problems.