

List of issues for the diploma exam

Field of study: Automatic Control and Robotics	Level of study: first cycle studies
Specialization:	

No.	Issues
1	Ways to pass arguments to functions in C++. [Information engineering]
2	The role of the IP address in network communication. [Information engineering]
3	Representation of w floating point variables in memory. Storing in memory and referring to containers of STL library: vector, map, list. [Information engineering]
4	Basic laws of electrical engineering. [Electrical engineering]
5	Conservation laws in physics. [Physics]
6	Normal stress - strength criterion, allowable stress, and factor of safety. [Theoretical mechanics and mechanics of materials]
7	Quantities characterizing random signals. [Signals and dynamic systems]
8	Models of dynamic objects. [Signals and dynamic systems]
9	Tuning of linear controllers; control performance indices. [Control basics]
10	Interplay between frequency- and time-domain responses. [Control basics]
11	Criteria for sensor classification; linear and angular position sensors and converters. [Devices of automation and actuators]
12	Programming model for real-time systems. [Real-time systems]
13	Process synchronization and communication mechanisms. Real-time algorithms for tasks scheduling. [Real-time systems]
14	Measurement uncertainty. [Metrology]
15	Sensors and transducers of non-electrical quantities. [Metrology]
16	Microcontroller peripherals (GPIO, TIM, PWM, ADC, DAC, UART, SPI, I2C, CRC, RTC, PWR, WDT), operation and parameters, typical hardware input and output interfaces. [Microprocessor systems]
17	Microprocessor system for network communication (Ethernet, IPv4, TCP, UDP, HTTP, SNMP). [Microprocessor systems]
18	Software and hardware implementation, incl. multiplexers, demultiplexers, flip-flops and memory. Software and hardware implementation of sequential and combinational circuits. [Microprocessor systems]
19	Direct and Inverse kinematics of robot manipulators. Classification of methods for solving inverse kinematic problem. [Robotics]
20	Robot manipulator dynamics model. [Robotics]
21	Robot control methods; hybrid force/position control of robots. [Robotics]
22	Basic system identification methods for ARX and OE structures (including model order estimation). [System identification]
23	Identifiability and parameter estimation in a closed-loop system. [System identification]
24	Motion commands of robot manipulators and their parameters. Kinematic singularities of robot manipulators. [Robot programming and task planning]
25	Offline robot programming. [Robot programming and task planning]
26	State observers. [Control theory of the continuous and discrete events processes]
27	Automated electronic circuit assembly methods: wave soldering and reflow soldering. Process description and recommendations for the PCB design adjusted to the given manufacturing method. [Electronical and electrical circuits designing]
28	Scalar and vector control of AC induction motors. [Control of motion and electric vehicles]
29	Cascade control of position, speed and current of the electric drive - influence of limitations on output signals. [Control of motion and electric vehicles]
30	Mechanical joints in machine design. Basic machine parts of the drive systems (axles and shafts, bearings, clutches, brakes and transmissions). [Mechanical constructions]
31	Peripherals handler in Linux (GPIO, SPI, I2C, UART). Data and metadata structures in JSON for sensors and actuators. [Networks and distributed control systems]

32	Client-server architecture in terms of the web interface. Implementation of the server application (python, PHP, C) and client application (HTML, CSS, JS). [Networks and distributed control systems]
33	Attitude sensors in aerial robots. Hardware components of multi-rotor flying platforms. Quadrotor flight dynamics and control. [Flying robots]
34	Principle of operation of basic functional blocks of programmable controllers, timers and counters. [Digital controllers and PLC]
35	Rules of creating programs in languages: LD, FBD and SFC. Cycle of operation of a programmable controller. [Digital controllers and PLC]
36	Types of production and concepts of their automatization. [Flexible manufacturing systems]
37	Petri nets. [Flexible manufacturing systems]
38	Numerical modelling of dynamic objects. Advanced control structures (2DOF, Smith predictor, internal model control, predictive model control, artificial neural networks). [Analysis of control systems]
39	Communication mechanisms between nodes in Robot Operating System. [Tools and software for robotic systems]
40	Scientific libraries available in Python. Describe at least two of them. [Tools and software for robotic systems]