

Automatic Control Devices

Study programme: N0714A270012 Control of Machines and Processes
Academic year: 2023/2024

1. Hierarchical structure, distributed and multi-level management systems and their decomposition, reasons for deployment.
2. Main methods of describing elements and subsystems of technological processes (static and dynamic properties of elements of measuring and control systems). Basic terms – sensitivity, accuracy, time constant, sampling period, control quality.
3. Sensors and transducers - distribution, structure and properties, physical principles,
4. Methods and sensors for measuring dimensions, length, presence of objects, position, level height of liquids and loose materials (principles of the main types of sensors, ranges, errors, examples of applications).
5. Methods and sensors for measuring flow rates and pressures of gases and liquids (principles and design of sensors, comparison of properties, ranges, examples of use).
6. Methods and sensors for measuring temperature and heat (physical principles and types of sensors, comparison of properties, contact and non-contact measurement, ranges and examples of use).
7. Methods and sensors for measuring speed, revolutions, weight, forces, torque and vibrations (basic principles and types of sensors, ranges, examples of use).
8. Unification (standardized) of control system signals (signal amplification members, signal unification members, signal interference, examples...).
9. Interface of control systems in industry (types of input/output signals, A/D, D/A converters, structure and properties, connection method with PC, implementation example).
10. Regulators, IPC, (description of internal structure, configuration options, interface, ...).
11. Circuit elements for processing electrical signals (operational amplifier, transistor, diode, ...), including a description of basic connections with an operational amplifier.
12. Power elements for switching of actuators (transistor, thyristor, relay, contactor, ...).
13. IPC control computers (architecture, technical and software equipment, methods of connection to the technological process, current trends in this area).
14. Logical tasks (procedure for solving combinational and sequential logical tasks, example ...).
15. Elements for logical information processing (logic circuits, gates, switches/contacts, flip-flops, circuit elements).
16. PLC – internal structure of programmable logic controllers, description of individual parts, compact and modular PLCs, examples of PLCs, communication options, deployment in a hierarchical management structure.
17. PLC - programming languages based on line and block diagrams and direct programming (description with examples, advantages, possibility of conversion between languages, ...).
18. SCADA/MMI systems (use, environment, properties, advantages, deployment of systems in a hierarchical control structure, links, programmability and openness of the system, real-time control...).

19. Information transmission over short distances – inter-circuit communication (I2C, SPI, digital transmission systems and buses).
20. Single-chip computers (basic properties, internal structure, configuration options, communication, implemented modules, instruction set, development environments for programming...).
21. Information links of hierarchical control structure, architecture, properties and use of computer networks (OSI network structure model, LAN-MAN-WAN computer networks, immunity to interference, industrial computer networks, WLAN wireless networks, examples of use).
22. Drives and actuators (distribution, structure, properties, comparison, methods of their control).
23. MEMs systems (internal structure, output signals and type of transferring measured data, sampling, examples of use).