Lista zagadnień na egzamin dyplomowy

Kierunek studiów: **Automatic Control and Robotics** Stopień studiów: **pierwszy**

Specjalność:

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| Nr | Zagadnienia |
| 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, SNTP). **[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]** |
| 27 | Design and manufacturing process of the Printed Circuit Board - from concept to manufacturing, assembly and testing. **[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 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]** |