Questions for the Masters Degree exam

Automation and Robotics

1. Describe the methods for selecting the sampling period in the A/A processing.
2. Discuss the method of compensation design of digital controllers.
3. Draw the diagram and discuss the principles of control based on feedback from the observed state vector.
4. Describe two ways of designing digital control systems for continuous-time plans.
5. Describe the form and characteristics of discrete time linear dynamic models as tools/methods for implementation of digital systems.
6. Discuss discrete approximation methods of continuous-time systems.
7. Describe the conditions and effects of quantization in control systems.
8. Discuss different variants of ACK passing techniques between I/O devices and the microprocessor system. Describe hardware support for decreasing latency of input and output actions causing interrupts.
9. Discuss different variants of the multiprocessor and multicomputer systems and describe the most important features of the industrial multiprocessor system buses.
10. Describe selected microcontroller architectures including microcontrollers based on ARM cores.
11. Stabilization of SISO systems – lessons from the Bode integral.
12. Discuss principles and present examples of predictive control systems.
13. Discuss the analytical methods for finding the minimum of the multivatiate function without additional constraints.
14. Discuss the deterministic numerical methods for finding the minimum of the multivariate function without additional constraints.
15. Describe the structure of the fuzzy controller and explain the fuzzy inference mechanism.
16. Under what circumstances the autoregressive model may be nonidentifiable? What are the ways of restoring identificability?
17. What do we mean by statistical model validation and what methods can be used for this purpose?
18. Discuss the method of independent component analysis. What are the limitations of this approach and what are its potential applications?
19. Present the most important characteristics of random variables.
20. Discuss Kalman filtering technique: assumptions, the way of operation and potential applications.
21. Characterize direct and indirect approach to minimum variance control of autoregressive systems – discuss advantages and dis advantages of each technique.

22. What is meant by dual adaptive control? What are the main differences between dual control and “certainty equivalence” control? Why dual control cannot be used in practice?