ITMO UNIVERSITY

LIST OF ENTRANCE EXAM QUESTIONS

FOR THE INTERNATIONAL MASTER'S DEGREE PROGRAM

DIGITAL CONTROL SYSTEMS

1. Stability of continuous-time systems: definition, the s-plane root location, Routh-Hurwitz stability criterion.
2. Frequency response. Bode plot.
3. Standard mathematical models of systems: input-output models, state-space models.
4. Lyapunov's method of determining the stability of continuous-time systems.
5. Full-order and reduced-order state observers for continuous-time systems (Luenberger observer).
6. Modal (pole placement) control method for controllers synthesizing.
7. PID controller parameters tuning using the Ziegler and Nichols method.
8. Performance characteristics (specifications) of system: overshoot, settling time, steady-state error, relative stability, damping ratio.
9. First-order and second-order systems: transfer functions, step response, impulse response.
10. Block diagram transformations: series, parallel and feedback connection.
11. Structural properties of mathematical models: controllability and observability. Criteria for controllability and observability for continuous systems.
12. The concept of transfer function and transfer matrix of a continuous system.
13. Stability analysis of a discrete systems.
14. Discretization of continuous signals.
15. The Nyquist stability criterion.
16. Steady-state accuracy. Steady-state errors in unity-feedback control systems with different type number (the number of integrations).

EXAM PREPARATION MATERIALS

1. Karl Johan Åström and Richard M. Murray, Feedback systems: an introduction for scientists and engineers // Princeton University Press, 2008.
2. Dorf, Richard C., and Robert H. Bishop. Modern Control Systems, Pearson, 13th Edition, 2017.
3. F.W. Fairman, Linear control theory. The state space approach, John Wiley & Sons, 1998.
4. K. Ogata, Modern Control Engineering, Prentice-Hall, Englewood Cliffs, NJ, USA, 3rd edition, 1997.
5. Rolf Isermann, Digital Control Systems: Volume 1: Fundamentals, Deterministic Control, 2nd Edition, ISBN 978-3-642-86417-9, Springer Science & Business Media, 2013, P. 336.
6. M. Sami Fadali, Antonio Visioli, Digital control engineering: analysis and design, Second edition. ISBN 978-0-12-394391-0, Academic Press, 2012, P. 600.