

Industrial Robot Systems
Examination Questions for the Final Exam
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1. The concept of „Group” and Lie Groups
2. Generators of Lie Groups, exponential series of constant generators, Lie algebra, the geometric interpretation of the Lie brackets (commutators), Jacobi identity
3. Basis vectors in the tangent space, structure coefficients, commutation relations
4. Homogeneous matrices as Lie groups: their generators and the physical interpretation of the generators
5. Parametrization of Lie groups with special emphasis on the Orthogonal Group
6. The basics of Classical Mechanics: space and time, inertial systems of reference, Newton's Postulates
7. The Variation Principle in Classical Mechanics: generalized coordinates, the Lagrangian, the Euler-Lagrange equations for isolated systems
8. The Euler-Lagrange Equations for not isolated system: the generalized forces
9. Industrial robots of open kinematic chain, the application of homogeneous matrices for setting the dynamic model of the robot
10. The „Computed Torque Control”: the general form of the dynamic model
11. Lyapunov's 2nd or „Direct Method”: the stability definitions, Lyapunov function, quadratic Lyapunov function, functions of class „K”
12. The Sliding Mode /Variable Structure Robust Controller: error metrics, relative order of the system under control, chattering and its elimination
13. Adaptive Inverse Dynamics Controller for Robots
14. Adaptive Slotine-Li Controller for Robots
15. Robust Fixed Point Transformations in adaptive control: Banach's Fixed Point Theorem
16. The Model Reference Adaptive Controller based on Robust Fixed Point Transformations