**Information Systems and Control**

**Questions of the final exam**

**BSc**

**(Valid from 1st November 2020)**

1. Characterization and description of systems. Classification of signals. Closed loop and open loop control. The most important elements and the set-up of a closed loop control system. Requirements of the closed loop control.
2. Linear system models: input-output models and their features. Test signals and their features. The impulse response (weight function) and the step response function. The transfer function. Investigation of systems in time and operator domain (complex frequency domain).
3. Fourier-series and Fourier-integral. The applicability of Fourier- and Laplace-transforms and their theorems. The inverse transforms.
4. The most important dynamic terms (Zero, first and second order terms, ideal integral and first order integral terms, ideal derivative and realizable derivative terms) and their characterization. Demonstration of the effect of their parameters using the impulse- and step response functions. Influence of the poles to the transient part of the output function.
5. System investigation in frequency domain. Introduction of the frequency response and its representation possibilities. The Nyquist- and the Bode-plot and their features. Frequency responses and the Nyquist- and the Bode-plots of the most important dynamic terms (Zero, first and second order terms, ideal integral and firs order integral terms, ideal derivative and realizable derivate terms).
6. Stability investigation of systems. Stability definitions and theorems. Stability investigation methods: Stability investigation in frequency domain (Nyquist and Bode criteria).
7. Control of continuous time systems. Set-up of a closed loop control system, Determination of the resultant transfer function. Classification of controllers based on the degree of their denominator, type number of control systems. The role of the proportional, integral, and derivative terms in a controller.
8. Characterisaton of P-, PI-, PD- and PID-controllers in time, operator and frequency domain. Tuning methods of PID-controllers.
9. Discrete time systems. Types of sampling. Concepts of physical and mathematical sampling. Shannon-theorem. The definition of z- and inverse z-transform its features and implementation possibilities. Discretization methods.
10. Control of discrete time systems. Discretization of the continuous time PID control algorithm, position and velocity algorithm. Set up methods for discrete time controllers. The role and interpretation of hold.