RAL – MicroProject – Algebraic part

Design the robust RST controller operating with the sampling period $T_s = 0.2\ s$ for the system with transfer function $F_s(s)$ with respect to the following requirements.

- Modulus stability margin $\Delta M = -6\ dB$
- A zero steady-state control error of the closed-loop system is required (integrator in the system).
- The closed-loop system (characteristic polynomial) must behave the same as a discrete equivalent of a second-order continuous system $F_M(s)$.

$$F_M(s) = \frac{\omega_0^2}{s^2 + 2\xi\omega_0 s + \omega_0^2}$$

where dumping ξ is constant.

- Ensure a fast closed-loop system F_w response. (parameter ω_0)
- Design the controller which suppresses static disturbance with frequency f_p by AdB [dB].
- High-frequency disturbances must be reduced ($f > 0.4 f_s$) $\left|F_v\left(e^{j\omega}\right)\right| < 3\ dB$.

The unknown values can be obtained by the enclosed function

```
[Fs,ksi,fp,AdB] = mydata_2024(your_id)
```

% MYDATA This function will generate the necessary data based on your ID.

Evaluation requirements:

The project will include:

- Source files for the MATLAB version installed on the PC in T12/SD 2.105.
- The output of your source files will be pictures:

  - Sensitivity function and sensitivity function template

  - Step response of the closed-loop system F_w

  - Response to a harmonic disturbance that acting on the output of the system $F_s(s)$ with a frequency f_p

The project evaluation will take place in the 7th week of the semester during the computer exercises (19.3.2024 11:00-13:00 T12/SD 2.105). You can either do the project on your own and hand it in at the mentioned exercise or do it with the lecturer's advice during the exercise. Utilizing the template prepared in e-learning is recommended. Later submission is only possible to email: lukas.zezula@ceitec.vutbr.cz and is penalized by -2 points for each day of delay. The microproject is evaluated with a maximum of 15 points.