

Ahsanullah University of Science and Technology

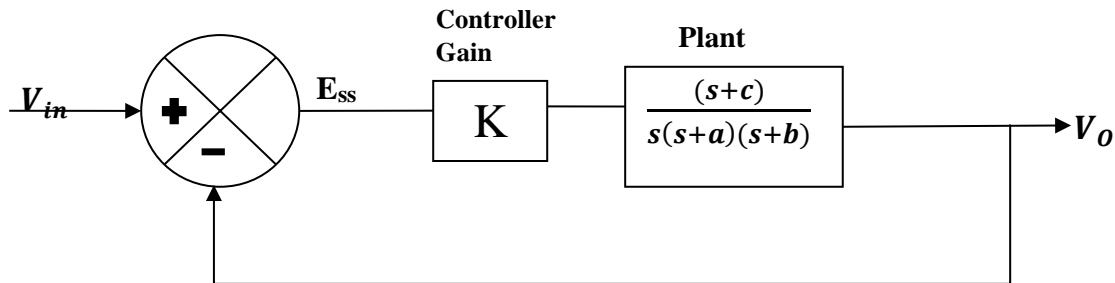
Department of EEE

4th Year 1st Semester, Fall 2019

Course No.: EEE 4106

Course Title: Control System-I Lab.

1. Consider the following closed loop system



- a) You are required to design the system in Simulink environment by selecting appropriate **K**, '**a**', '**b**' and '**c**' such that the percentage overshoot, **%OS=X0%** and settling time, **T_s (Z%) =Y seconds** with a steady-state error, **E_{ss}= 0.045** when a **unit step input** is provided and **the system remains second order**. The value of **E_{ss}** must be displayed in the design using “**Display**” block.

[Here, **X**= Second Last digit of your student ID divided by 2 and take the next integer value.

If Second Last digit of your student ID =0, then **X**= Summation of last 3 digits of your student ID divided by 2 and take the next integer value.

Z= Group No. Based { A1, B1, C1=2%, A2, B2, C2= 5% }

Y= Last digit of your student ID divided by 2 and take the next integer value.

If Last digit of your student ID =0, then **X**= Summation of last 3 digits of your student ID divided by 2 and take the next integer value.]

- b) Show the **open loop Bode plot** for the aforementioned system and specify all the stability margins in the same Simulink model for question no. 1(a).
- c) Now compensate the existing plant you have designed without changing the initial parameters in question no. 1(a) for the following specifications: **%OS=M0%** and **T_s (2%) =N seconds**. And the compensated system should be **error free**.

[Here, **M= X+1**, **N=Y+1**]

- d) Show the **open loop Nyquist plot** for the aforementioned system and specify all the stability margins in the same Simulink model for question no. 1(c).

Make a project report including

- all the necessary calculations (include the calculation of the values of **X**, **Y**, **Z**, **M** and **N**)
- Simulink circuit diagrams using active elements and the corresponding system outputs.
- Attach all the Simulink files to the Google Drive specified by the respective course teacher. The Simulink file names should be your student ID (Example: 130105004_a, 130105004_c)