Final Semester Evaluation
YY NNNN - *AUTOMATIC CONTROL*

Lecturers :
Day/Date : _____ / _____ __, 20__
Classroom/Time : _____ / __.__ - __.__ (120 minutes)
Method : Closed Book
Warning : *The consequences of all indications of ethical misconducts during the evaluations are the failure of the course (minimum) up to the termination of undergraduate study* (*maximum*)

Score : 25% *Outcome c(25%)*

1. Consider a control system with the following open loop transfer function :

$$G(s) = \frac{K}{(s^2 + 2s + 2)(s^2 + 2s + 5)} \quad ; \quad H(s) = 1 \text{ (unity feedback)}$$

Determine the exact points where the root loci cross the $j\omega$ axis

Score : 30% *Outcome c(30%)*

2. Consider a unity feedback control system with the following open loop transfer function :

$$G(s) = \frac{1}{s^3 + 0{,}2s^2 + s + 1}$$

a. Draw a Nyquist plot of $G(s)$.
b. Plot the Bode Diagram of the closed loop system

Score : 15% *Outcome a(15%)*

3. Consider the following transfer function :

$$G_c(s) = K\frac{s + b}{s + a}$$

Where a, b and K are positive real numbers. What is the condition for a and b for $G_c(s)$ to be a lead network or a lag network ?

Score : 30% *Outcome e(30%)*

4. Consider a unity feedback control system with the following open loop transfer function :

$$G(s) = \frac{10}{s(s + 1)}$$

Design a compensator such that the dominant closed loop poles have the damping ratio ζ = 0,5 and the undamped natural frequency ω_n = 3 rad/sec.