



ISTANBUL AYDIN UNIVERSITY  
INSTITUTE OF GRADUATED EDUCATION

EED604E OPTIMIZATION  
FINAL EXAM  
Assist. Prof. Dr. Mohammed ALKRUNZ

2024/2025  
FALL SEMESTER

29/01/2025

Exam Duration  
60 Minutes

Student's Name and Surname : Huseym KURT

Student Number : 42313.102001

Student's Signature :

Questions	1	2	TOTAL
Maximum Score for the Question	30%	70%	100%
Student's Score			

**Q1:**

Discuss briefly the difference between the direct STR and the indirect STR. Support your discussion with the block diagram of both of them. Besides, talk about the advantages and disadvantages of both of them.

**Q2:**

A process has the transfer function:

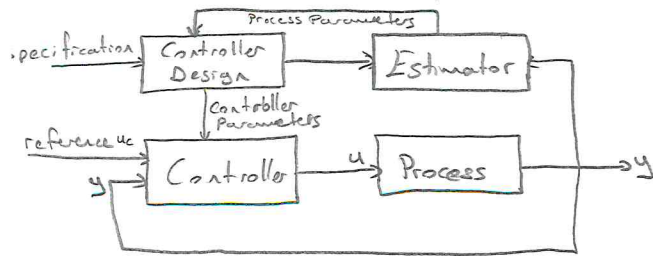
$$G(s) = \frac{1}{s(s+1)}$$

The desired closed-loop system is:

$$G_m(q) = \frac{B_m(q)}{A_m(q)} = \frac{0.1761q}{q^2 - 1.3205q + 0.4966}$$

- 1) Find the pulse transfer function of the process system if the sampling time is  $h = 0.3 \text{ sec}$ .
- 2) Construct a discrete-time **indirect self-tuning algorithm** for the system
  - a) Consider model following with zero cancellation.
  - b) Consider model following without zero cancellation.

## Q1) Simple Block Diagram of STR $\Rightarrow$



For an indirect STR, the process parameters are estimated by the available estimation technique. These estimated parameters are used for design of the controller. To be clear, the process parameters are estimated first (in transferfunction or state-space model). After defining the process parameters, the controller parameters are calculated based on this estimated process.

For direct STR, the process is first re-parameterized, then the controller parameters estimated by the available estimation. Hence, the result of parameter estimation will be directly the controller parameters, instead of process parameters.

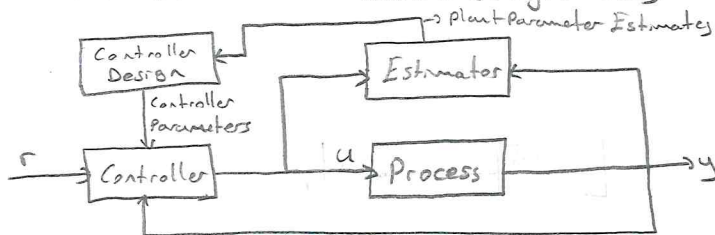
The advantages of Indirect STR are; being more robust since it is computed from the estimated process model.

The disadvantages of Indirect STR is; being slower.

The advantages of Direct STR are; being faster, thus a lot of computation time is saved.

The disadvantages of Direct STR are; being less robust since it is directly adjusted.

## For Indirect STR Block Diagram $\Rightarrow$



## For Direct STR Block Diagram $\Rightarrow$

