

CHAPTER 10 SOLVED PROBLEMS

SP10-1. Tune a PID controller for the following second-order process:

Gain = 1.07
Deadtime = 1.5 minutes
First time constant = 4.4 minutes
Second time constant = 5.4 minutes

Find the PI controller parameters using the Ziegler-Nichols closed-loop method. Attach the plot of the sustained oscillations used to determine the controller parameters. Also, attach the plot of the closed-loop response of the system with a PI controller to a disturbance change of plus or minus 10.

SP10-2. Tune a PID controller for the following second-order process:

Gain = 0.98
Deadtime = 1.6 minutes
First time constant = 3.5 minutes
Second time constant = 4.2 minutes

- Find the approximate first-order model of the process. Attach the open-loop response of the system used to obtain the approximate model.
- Using the model obtained in (a), find the PI controller parameters (K_p , T_i) using the Cohen-Coon (**without** constraints) and Fertik open-loop methods. For the Fertik method, tune the controller for a **setpoint** response.
- Using the model obtained in (a), find the PID controller parameters (K_p , T_i , T_d) using the Cohen-Coon (**with** constraints) and Fertik open-loop methods. For the Fertik method, tune the controller for a **disturbance** response.