(Design & Computer Application)

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1. Problem IV.58 in the textbook (Chemical Process control by G. Stephanopoulos).

2. Compute the phase margin and gain margin of the feed back systems with the open-loop transfer function shown in problem IV.58 in the text book (Chemical Process Control by G. Stephanopoulos). On the basis of these values find which systems are stable and which are not.

3. The process reaction curve of a temperature control system gave the values:

   $K = 10$ $\tau = 2$ minutes $t_d = 0.1$ minutes

   a- Select the PID controllers parameters using the Ziegler–Nichols tuning technique.
   b- Select the PID controllers parameters using Cohen-Coon technique
   c- Compare the values obtained in (a) and (b).
   d- Assume that the values of K, τ and t_d obtained from the process reaction curve are not very reliable. Compute the percent error in the values of K, τ and t_d which can be tolerated by Ziegler-Nichols settings before the closed-loop response become unstable.