SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 35

Department of Electrical & Electronics Engineering

LEAD COMPENSATOR

INTRODUCTION

Three design rules for cascade compensator:

1. The system is stable with satisfactory steady-state error, but dynamic performance is not good enough.

   Compensator is used to change medium and high frequency parts to change crossover frequency and phase margin.

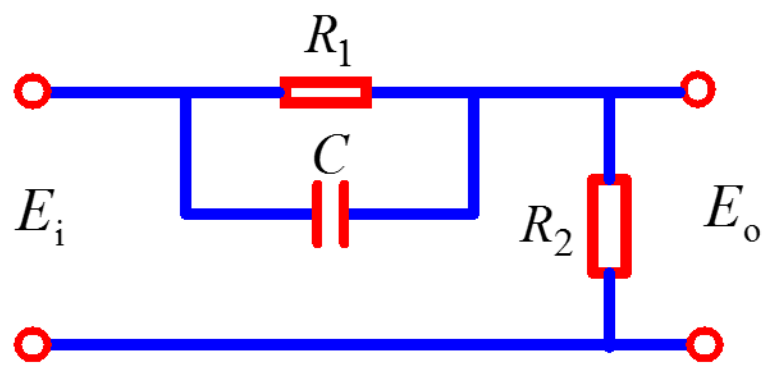
2. The system is stable with satisfactory transient performance, but the steady-state error is large.

   Compensator is used to increase gain and change lower frequency part, but keep medium and higher frequency parts unchanged.

3. If the steady-state and transient performance are either unsatisfactory, the compensator should be able to increase gain of the lower frequency part and change the medium and higher frequency parts.

1. Transfer function：

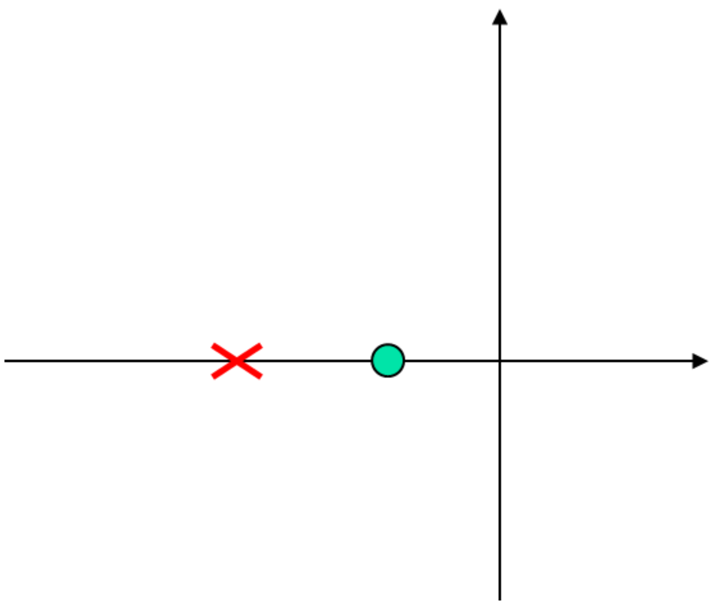
$$G_c(s)=\frac{E_o(s)}{E_i(s)}=\frac{1}{\alpha}\times\frac{1+\alpha Ts}{1+Ts}$$



Passive Phase Lead Network

where

$$\alpha=\frac{R_1+R_2}{R_2}>1, T=\frac{R_1R_2}{R_1+R_2}C$$



Rules to design phase lead compensation

(1) Determine K to satisfy steady-state error constraint

(2) Determine the uncompensated phase margin γ_0

(3) estimate the phase margin φ_m in order to satisfy the transient response performance constraint

(4) Determine α

(5) Calculate ω_m

(6) Determine T

(7) Confirmation