SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 35

Department of Electrical & Electronics Engineering

COMPENSATORS

LAG COMPENSATORS-DESIGN

Procedure for design of Lag Compensator:

Step 1:

Choose the value of K in uncompensated system to meet the steady state error requirement.

Step 2:

Sketch the Bode plot of uncompensated system. Determine the phase margin from the plot. If the phase margin does not satisfy the requirement then lag compensation is required.

Step 3:

Choose a suitable value for the phase margin of the compensated system.

γ_d = Desired phase margin as given in specifications

γ_n = phase margin of compensated system.

$\gamma_n = \gamma_d + \varepsilon$. $[\varepsilon = 5^\circ]$.

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Step 4:

Determine the new gain cross over freq. ω_{gcn}.

Let $\phi_{gcn} = \angle G(j\omega)$ at new gain cross over freq. ω_{gcn}.

$$\gamma_n = 180^\circ + \phi_{gcn} \quad (\text{or}) \quad \phi_{gcn} = \gamma_n - 180^\circ.$$

Step 5:

Determine the parameter 'β' of the compensator. The value of β is the magnitude $G(j\omega)$ at ω_{gcn}.

$$A_{gcn} = 20 \log \beta \Rightarrow \therefore \beta = 10^{A_{gcn}/20}.$$

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Step b:

Determine the transfer fn. of lag compensator.

Place zero of comp. arbitrarily at $1/10^{th}$ of ω_{gen}.

$$\therefore z_c = \frac{1}{T} = \frac{\omega_{gen}}{10}$$

$$T = \frac{10}{\omega_{gen}}$$

$$p_c = 1/\beta T$$

$$\therefore G_c(s) = \frac{s + 1/T}{s + 1/\beta T} \Rightarrow \beta\left[\frac{1+sT}{1+s\beta T}\right]$$

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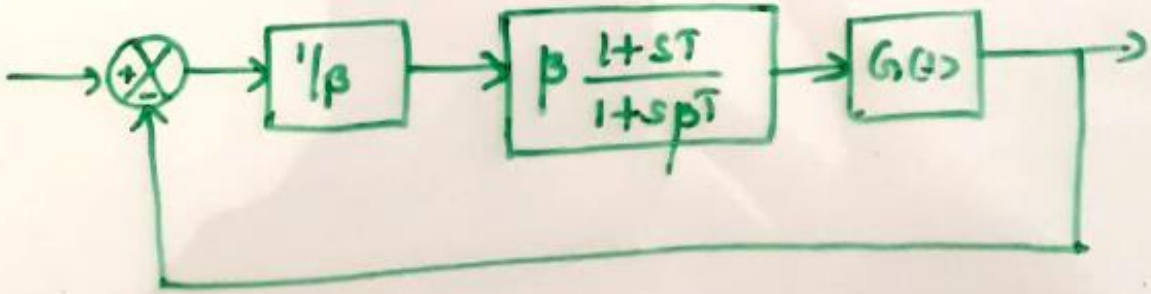
Step 7:

Determine the open loop transfer fn. of compensated system.



Step 8:

Determine the actual phase margin of compensated system.