English Textbook: B-7-32

1. The open-loop transfer function of a unity-feedback control system is

$$G(s)=\frac{126\times 10\times 60}{s(s+10)(s+60)}$$

Design a series compensator such that for r(t)=t1(t)

(1) ess≤1/126 rad

(2) $\gamma\geq 30°$, ω_c'=20 rad/s

(3) The open-loop gain remains unchanged.

2. The open-loop transfer function of a unity-feedback control system is

$$G(s)=\frac{400}{s^2(0.01s+1)}$$

The Bode magnitude plots of three minimum phase series compensators of the system are shown in the following figure. Determine which one can maximize the gain and phase margins. Moreover, if it is required that a sinusoidal function with a frequency 12 Hz be attenuated 10 times, which compensator should be chosen?

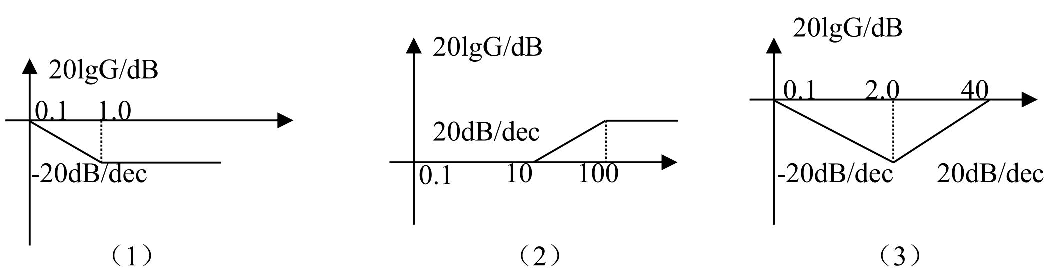

Figure 2

3 The open-loop transfer function of a unity-feedback control system is

$$G(s)=\frac{K}{s(0.05s+1)(0.2s+1)}$$

Design, by using root locus method, a phase lead compensator such that the static velocity error constant is no less than 5/s, Mp≤25% (5% error band) and ts≤1 /s.

4 The open-loop transfer function of a unity-feedback control system is

$$G(s) = \frac{K^*}{s(s+4)(s+5)}$$

Design, by using root locus method, a phase lag compensator such that the static velocity error constant is K_v=30/s, ζ =0.707 while the root locus in the neighborhood of the dominant closed-loop poles are not appreciably changed.