

1° ДЭМА

1-Д0, 2-В, 3-Г, 4-Д0, 5-Г

2° ДЭМА

1-В, 2-А, 3-А, 4-А, 5-А, 6-В

3° ДЭМА

$$G(s) = \frac{s}{(s+10)^2}$$

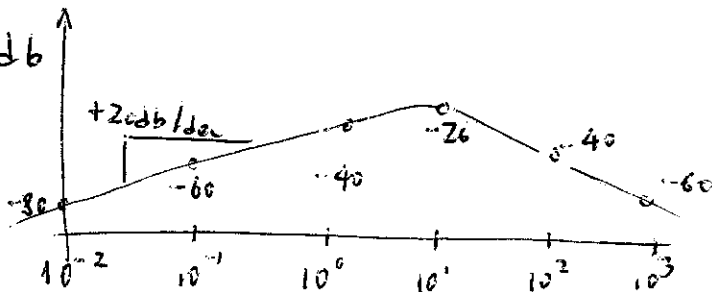
3.1 $\omega_i = \{0.01, 0.1, 1, 10, 100, 1000\} \quad i=1, \dots, 6$

3.1 $Y_i = \{10^{-4}, 10^{-3}, 10^{-2}, 0.05, 10^{-2}, 10^{-3}\}$

3.1 $\varphi_i = \{90^\circ, 88^\circ, 78^\circ, 0^\circ, -78^\circ, -88^\circ\}$

3.2

3.2 $\phi.5$ db



3.3

3.3 $\phi.5$

$$\lim_{t \rightarrow \infty} y(t) = \lim_{s \rightarrow 0} s \cdot \frac{1}{s} G(s) = 0$$

3.4

3.4 $\phi.5$

$$C(s) = \frac{K}{s}$$

$$e_{ss} = \frac{1}{1 + \lim_{s \rightarrow 0} \frac{K}{s} \frac{s}{(s+10)^2}} = \frac{100}{100 + K}$$

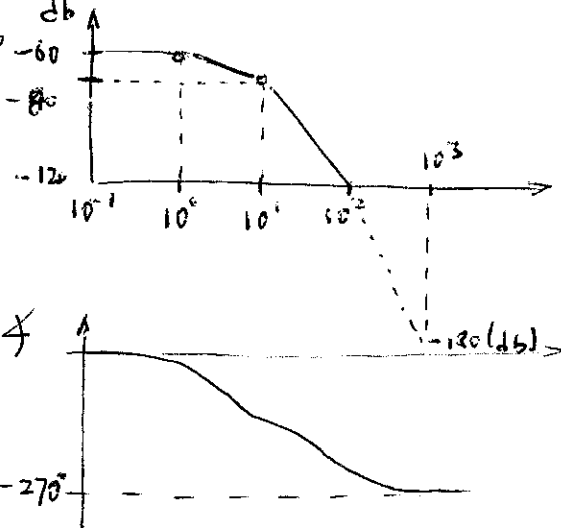
AN $K > 100 \quad e_{ss} < 0.5$

4° ДЭМА

$$G(s) = \frac{1}{(s+1)(s+10)(s+100)}$$

4.1

4.1 $\phi.5$



4.2 $\omega_{\text{дб}} = 10$

4.2 $\eta_{\text{дб}} \text{ ПЭР} = 10$

4.2 $\omega_{-180^\circ} = 33 \text{ рад/сек}$

4.2 $\text{ПЭР} \text{ КЭР} = 102 \text{ дб}$

4.3

4.3 $\phi.5$

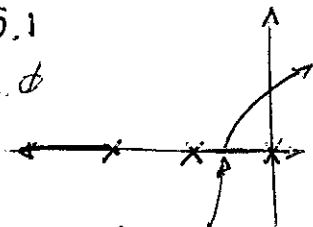
$$e_{ss} = \frac{1}{1 + \frac{K}{1 \cdot 10 \cdot 100}} < 0.5$$

$K > 1000$

5ο ΘΕΜΑ

5.1

1. ς



ΓΙΑ $K^0 = 0.385$

3 ρίζες @ -0.438

5.2

1. ς

$$Q_{ss} \Big|_{1(s)} = \frac{1}{1 + \lim_{s \rightarrow \infty} \frac{K^0 + \Delta}{s(s+1)(s+2)}} = 0$$

ΑΡΙΘ ΤΩ ΚΑ. ΣΥΣΤΗΜΑ ΝΑ ΕΙΝΑΙ ΕΥΣΤΑΘΕΣ

$$K^0 + \Delta < K^{cr} = 6.02 \Rightarrow \Delta < 5.635$$

6ο ΘΕΜΑ

$$\ddot{x} + 10,3423 \dot{x} + x^3 = F$$

6.1

0.5

6.2

1. ς

$\dot{x} = \ddot{x} = 0 \quad x^3 = F^e = 27 \rightarrow x^e = 3$

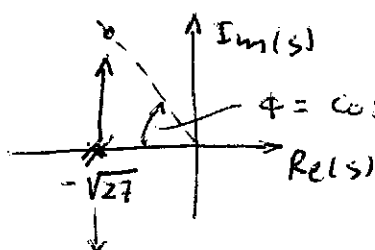
$$(\ddot{x}^e + \Delta \ddot{x}) + 10,3423 (\dot{x}^e + \Delta \dot{x}) + (x^e + \Delta x)^3 = F^e + \Delta F$$

$$\hookrightarrow \Delta \ddot{x} + 10,3423 \Delta \dot{x} + 3(x^e)^2 \Delta x = \Delta F + 3x^e \Delta x^2 + \Delta x^3$$

$$\Delta \ddot{x} + 2 \cdot \sqrt{27} \Delta \dot{x} + 27 \Delta x = \Delta F$$

$$\frac{\Delta x}{\Delta F}(s) = \frac{1}{s^2 + 2\sqrt{27}s + 27} = G(s)$$

6.3 ΕΝΑΣ ΕΛΕΓΚΤΗΣ ΚΕΡΔΟΥΣ $C(s) = K$ ΔΗΜΙΟΥΡΓΕΙ
 0.75 ΤΩΝ ΑΚΟΛΟΥΘΩΝ Ρ.Τ.Ρ.



$\phi = \cos^{-1}(3) = 84.2608^\circ$
 $-\sqrt{27}(1 \pm j \tan 84.26^\circ)$
 $= -\sqrt{27}(1 \pm j 9.95)$

Η ΧΑΡΑΚΤΗΡΙΣΤΙΚΗ ΕΞΙΣΩΣΗ ΤΟΥ ΚΑ. ΣΥΣΤΗΜΑΤΟΣ
 ΕΙΝΑΙ $\text{den} \left(\frac{KG(s)}{1+KG(s)} \right) = s^2 + 10,3423s + 27 + K = 0$

ΓΙΑ ΑΥΤΗ ΤΗΝ ΤΙΜΗ Η ΑΠΑΙΤΟΥΜΕΝΗ ΤΙΜΗ ΤΟΥ

K ΕΙΝΑΙ $K_r = (9.95 \sqrt{27})^2 = 2,6731 \times 10^3$