Problem 1 Determine the root-locus curve for the continuous-time feedback system with the system functions

$$H(s)=\frac{1}{s+1} \quad \text{and} \quad G(s)=\frac{1}{s+2}$$

for the forward and feedback path, respectively. Use the real adjustable gain parameter K. Determine K for a stable feedback system.

Problem 2 Determine the root-locus curve for the discrete-time feedback system with the system functions

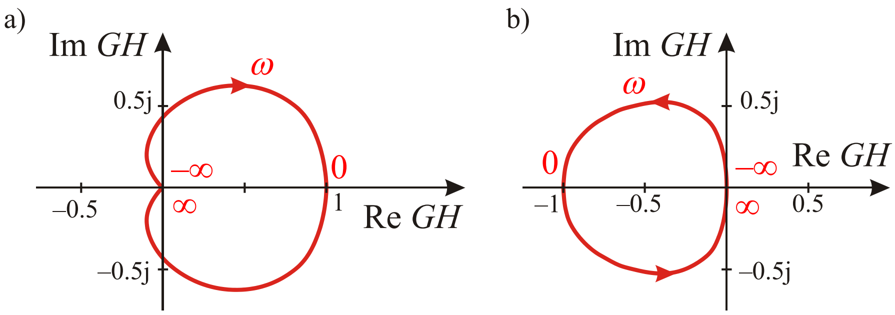
$$H(z)=\frac{1}{1-0.5\cdot z^{-1}} \quad \text{and} \quad G(z)=\frac{z^{-1}}{1-0.25\cdot z^{-1}}$$

for the forward and feedback path, respectively. Use the real adjustable gain parameter K. Determine K for a stable feedback system.

Problem 3 Two continuous-time feedback systems

a) $G(s)\cdot H(s)=\dfrac{2}{(s+1)\cdot(s+2)}$ b) $G(s)\cdot H(s)=\dfrac{2(s+1)}{(s-1)\cdot(s+2)}$

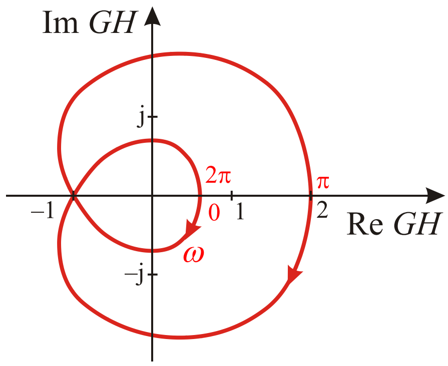
shall be considered. Their NYQUIST plots $G(\mathrm{j}\omega)\cdot H(\mathrm{j}\omega)$ are given below. Derive stability requirements for the real adjustable gain parameter K.



Problem 4 The discrete-time feedback system

$$G(z)\cdot H(z)=\frac{z^{-2}}{1+0.5\cdot z^{-1}}$$

shall be considered. The NYQUIST plot $G(\mathrm{e}^{\mathrm{j}\Omega})\cdot H(\mathrm{e}^{\mathrm{j}\Omega})$ is shown on the right. Derive stability requirements for the real adjustable gain parameter K.



Answers

Problem 1

$K > -2$

Problem 2

$-\frac{3}{8} < K < \frac{15}{8}$

Problem 3

a) $K > -1$

b) $K > 1$

Problem 4

$-\frac{1}{2} < K < 1$