

Indian Institute of Technology Kanpur
Department of Electrical Engineering
EE 250 Control Systems Analysis
Tutorial Session 5

10 March 2021

Question 1.

A). Draw the root locus plot for the system:

$$G(s) = \frac{s(1-s)}{(s+1)(s+2)}$$

B). Consider the compensator

$$C(s) = K \frac{(s-2)}{s^2}$$

where $K < 0$. Draw the root locus for the system.

Question 2.

A). Draw the root locus plot for the system:

$$G(s) = \frac{s-2}{s^2-1}$$

B). Consider the compensator

$$C(s) = -\frac{(22s+23)}{(3s+34)}$$

Draw the root locus for the system.

Question 3.

Consider a plant with open-loop transfer function as:

$$G(s) = \frac{1}{s^2-9}$$

- A). Design a lead compensator $C(s)$ such that the dominant close-loop pole of the system is at $-1 \pm j1$. The zero of the compensator is placed at -4.
- B). Find the close-loop transfer function and the DC Gain. Where is the third pole?
- C). What is the percentage overshoot of the compensated system? Will the compensated system follow the reference command? If not, what must be done to make the output follow the reference command?
- D). Draw a rough sketch of the root locus for the compensated system.