

To draw the root locus of a system, follow these steps:

Determine the Open-loop Transfer Function: Start by obtaining the open-loop transfer function of the system. The open-loop transfer function represents the relationship between the output and input of the system without any feedback.

Identify the Poles and Zeros: Determine the poles and zeros of the open-loop transfer function. Poles are the values of 's' that make the denominator of the transfer function zero, while zeros are the values of 's' that make the numerator zero.

Determine the Number of Branches and Asymptotes: Count the total number of poles and zeros to determine the number of branches in the root locus. The number of branches is equal to the number of poles. Also, determine the number of asymptotes, which is equal to the difference between the number of poles and zeros.

Calculate the Breakaway and Break-in Points: Find the values of 's' at which the root locus branches begin (breakaway points) and end (break-in points). These points can be calculated by solving equations derived from the open-loop transfer function.

Locate the Real Axis Points: Determine the points on the real axis that are part of the root locus. These points are located to the left of an odd number of real-axis poles and zeros.

Sketch the Asymptotes: Draw the asymptotes of the root locus. Asymptotes are straight lines that start from the breakaway points and approach the angles determined by the number of asymptotes.

Calculate the Departure and Arrival Angles: For each branch, calculate the departure angle (angle of the root locus at a pole) and the arrival angle (angle of the root locus at a zero). These angles can be calculated using mathematical formulas.

Sketch the Root Locus: Using the calculated angles, draw the root locus branches from the poles to the zeros. The branches follow the asymptotes until they approach the real-axis points or encounter other poles/zeros.

Evaluate the Behavior: Analyze the behavior of the system based on the root locus plot. The system is stable if all the branches of the root locus lie in the left-half plane. If any branch crosses the imaginary axis into the right-half plane, the system becomes unstable.

Check for Additional Points: Check for any additional points of interest, such as intersection points with the imaginary axis, the location of the centroid, or any other special features relevant to the system.