SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

Course Name: Control Systems

III Year : V Semester

Unit III –Frequency Response Analysis

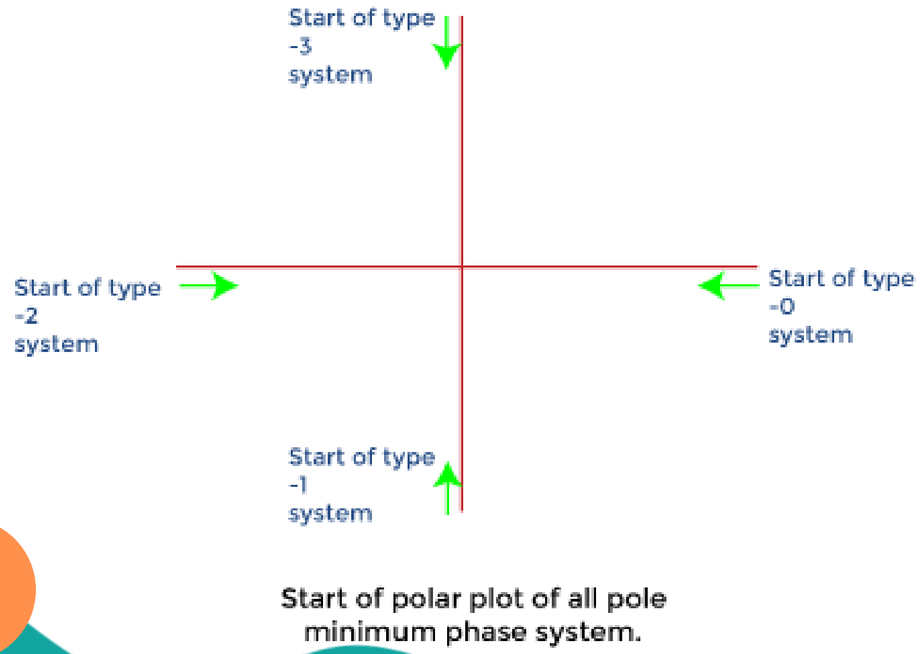
Topic : Polar Plot

Introduction

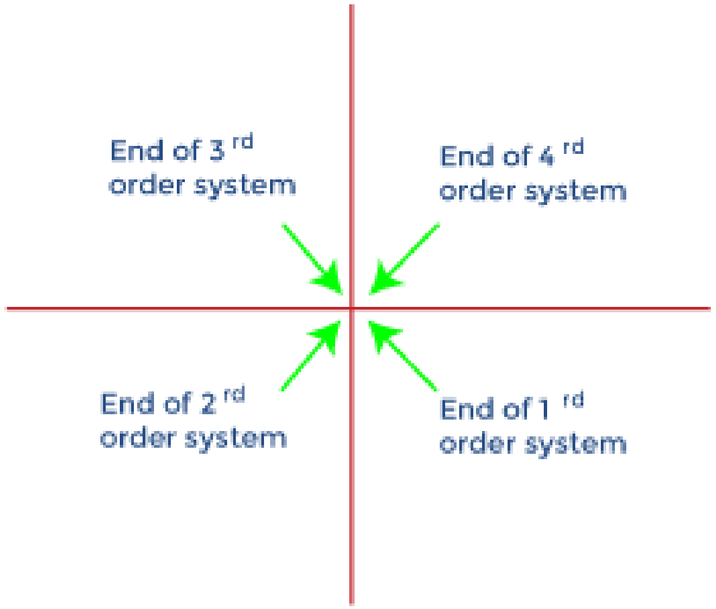
- Polar plot is a plot which can be drawn between magnitude and phase. Here, the magnitudes are represented by normal values only.
- The polar form of $G(j\omega)H(j\omega)$ is $G(j\omega)H(j\omega)=|G(j\omega)H(j\omega)|\angle G(j\omega)H(j\omega)$
- The Polar plot is a plot, which can be drawn between the magnitude and the phase angle of $G(j\omega)H(j\omega)$ by varying ω from zero to ∞.
- The polar plot is drawn on the polar sheet, which is the form of a graph, and the graph consists of concentric circles and radial lines.
- The concentric circles on the polar sheet graph represent the magnitude, and the radial lines represent phase angles. Each point on the graph displays information about the magnitude and the phase angle.

Type and order of the system

•The type of the system in the polar plot determines the quadrant at which the polar plot starts. The order of the system in the polar plot determines the quadrant at which the polar plot ends.



Start of polar plot of all pole minimum phase system.



Rules for Drawing Polar Plots

- Substitute, s=jω in the open loop transfer function.
- Write the expressions for magnitude and the phase of G(jω)H(jω).
- Find the starting magnitude and the phase of G(jω)H(jω) by substituting ω=0. So, the polar plot starts with this magnitude and the phase angle.
- Find the ending magnitude and the phase of G(jω)H(jω) by substituting ω=∞. So, the polar plot ends with this magnitude and the phase angle.
- Check whether the polar plot intersects the real axis, by making the imaginary term of G(jω)H(jω) equal to zero and find the value(s) of ω.
- Check whether the polar plot intersects the imaginary axis, by making real term of G(jω)H(jω)) equal to zero and find the value(s) of ω.
- For drawing polar plot more clearly, find the magnitude and phase of G(jω)H(jω) by considering the other value(s) of ω.

Thank You