SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

UNIT III
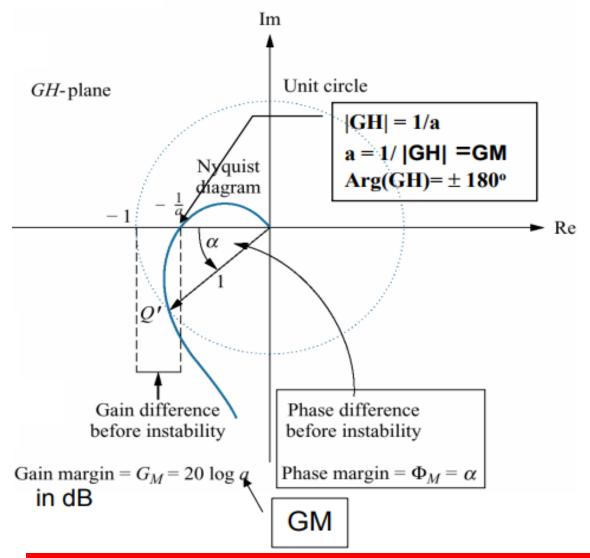
NYQUIST PLOT

Introduction-Nyquist

- The Nyquist diagram to define two quantitative measures of how stable a system is. These are called gain margin and phase margin. Systems with greater gain margin and phase margins can withstand greater changes in system parameters before becoming unstable.

- **Gain margin, GM**, The gain margin is the change in open-loop gain, expressed in decibels (dB), required at 180° of phase shift to make the closed-loop system unstable.

- **Phase margin, Φ_M**, The phase margin is the change in open-loop phase shift, required at unity gain to make the closed-loop system unstable.

INTRODUCTION

GH-plane

Im

Unit circle

$|GH| = 1/a$

$a = 1/ |GH| = GM$

$Arg(GH) = \pm 180°$

Nyquist diagram

-1

$-\frac{1}{a}$

α

1

Re

Q'

Gain difference before instability

Phase difference before instability

Gain margin $= G_M = 20 \log a$ in dB

Phase margin $= \Phi_M = \alpha$

GM

For stability, the PM must be positive. As the PM approaches 0 degrees, the system becomes more oscillatory

PROBLEM & STABILITY

https://www.youtube.com/watch?v=dXRQSm2vb7M --Nyquist Plot
(Problems) - Frequency Response Analysis - Control System

For stability, the PM must be positive.

As the PM approaches 0 degrees, the system becomes more oscillatory