

Control Systems

G V V Sharma*

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Abstract—The objective of this manual is to introduce control system design at an elementary level.

Download python codes using

```
svn co https://github.com/gadepall/school/trunk/
control/ketan/codes
```

1 POLAR PLOT

1.1 Introduction

1.2 Example

1.3 Example

1.4 Example

1.5 Example

1.6 Example

1.7 Example

2 BODE PLOT

2.1 Gain and Phase Margin

2.1.1. Sketch the Bode magnitude and phase plots for

$$G(s) = \frac{(1 + 0.2s)(1 + 0.025s)}{s^3(1 + 0.005s)(1 + 0.001s)} \quad (2.1.1.1)$$

*The author is with the Department of Electrical Engineering, Indian Institute of Technology, Hyderabad 502285 India e-mail: gadepall@iith.ac.in. All content in this manual is released under GNU GPL. Free and open source.

Also compute the gain margin and phase margin.

Solution:

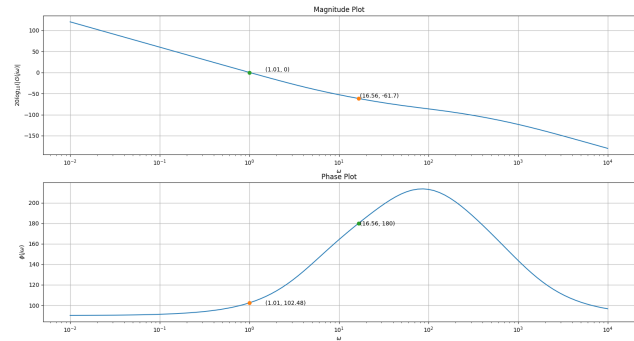


Fig. 2.1.1: Bode plot

From fig. 2.1.1,

$$\omega_{gc} = 16.55, \text{ Gain Margin} = -61.7\text{dB} \quad (2.1.1.2)$$

$$\omega_{pc} = 1, \text{ Phase Margin} = -77.52^\circ \quad (2.1.1.3)$$

The program for plotting bode plot and finding phase margin and gain margin -

```
codes/ee18btech11039/bode_plot.py
```

3 PID CONTROLLER

3.1 Introduction