Bode plot nptel pdf

Bode parcel is a graph commonly used in the engineering of the control system to determine the stability of the control system. The Bode surface maps the system's frequency response through two graphs – the Flat Magnitudo Bode (expression of magnitude in decibels) and the Boda phase sheet (expression of phase movement in degrees). Bode plots is in the 30th year of the 20th century. Although Bode plots offer a relatively simple method to calculate system stability, they can not handle the functions of transmission with the right half of the plane singularity (unlike the Nyquist stability criteria). The profit margin and stage rate shown in the Bode plan are crucial for profit and phase margins to understand Boda's plans. These conditions are defined below. Get marginOse greater is the profit margin (GM), the greater the stability of the system. The profit margin refers to the amount of profit that can be increased or reduced without the system being unacceptable. It is usually expressed as a magnitude in dB.Normally, we can read the profit margin directly from the Bode parcel (as shown in the diagram above). This is done by calculating the vertical distance between the magnitude curve (on the Magnitude Bode plots) and the x axis at the frequency where the bode is the phase plot = 180°. This point is known as phase transition frequency. It is important to establish that profit and profit margin are not the same thing. In fact, the profit margin is negative on profit (in decibels, dB). This will make sense when we look at the Gain margin formula. The gain marginA formula for gain margin (GM) can be expressed as: Where G is profit. This is a magnitude (in dB) as read from the vertical axis of the magnitude plot at the phase transverse frequency. In our example, shown in the graph above, Gain (G) is 20. Therefore, the use of our profit margin formula, profit margin is 0 – 20 dB = -20 dB (stable). Phase marginSA larger phase edge (PM) will be greater system stability. The phase margin refers to the amount of the phase which can be increased or reduced without the system being unacceptable. It is usually expressed as a stage in degrees. The phase margin can be read directly from the Bode parcel (as shown in the diagram above). This is done by calculating the vertical distance between the phase curve (on the Bode phase plot) and the x axis at the frequency where the Bode magnitude is = 0 dB. This point is known as gain crossover frequency. It is important to establish that phased and phase margins are not the same thing. This will make sense when we look at the phase edge formula. Phase edge formulaThota formula for phase margin (PM) can be expressed as: Where is the phased out (number less than 0). This is the phase as read from the vertical axis at the frequency of profit crossing. In our example, shown in the graph above, the phase is -189°. Therefore, the use of our phase margin formula is -189° – (-180°) = -9° (stable). As a second example, if the open loop amplifier acquires 0 dB at a frequency where the phased-off is -120°, then the phased-off is -120°. Therefore, the phase margin of this return system is -120° – (-180°) = 60° (stable). Bode Plot StabilityBelow is a summary of the list of criteria relevant to the extraction of Bode plots (and the calculation of their stability):Profit margin: The greater the profit margin the greater the stability of the system. It refers to the amount of profit that can be increased or reduced without the system being unacceptable. Usually expressed in dB.Phase margin: The higher the phase margin will be the stability of the system. It refers to a phase that can be scaled up or reduced without the system being unacceptable. It is usually expressed in the phase. Gain Crossover Frequency: Refers to the frequency at which the peri-bend magnitude cuts the zero dB os in flat bode. Crossover Frequency phase: Refers to the frequency at which the phase culpation reduces the negative times of the 180o axis in this flat. Corner frequency: The frequency at which asymptotees are cut or meet is known as break frequency or ing frequency. Rezonant frequency: The frequency value at which module G (jω) has an top value is known as rezonant frequency. Factors: Each loop transfer function {i.e.G(s) × H(s)} is the product of various factors such as the continuous expression K, Integral factors (jω), first order factors (1 + jωT)(± n) where n is an integer, second or square factor. Inclination: There is an inclination that corresponds to each factor and the inclination for each factor is expressed in dB per decade. Angle: There is an angle in degrees that corresponds to each factor and angle for each factor. Now there are some results to remember in order to plot the Bode curve. These results are written below:Permanent expression K: This factor has an inclination of zero dB per decade. There is no corner frequency corresponding to this constant expression. The phase angle associated with this permanent term is also zero. Integral factor 1/(jω)n: This factor has an inclination of -20 × n (where n is an integer)dB per decade. There is no corner frequency corresponding to this integral factor. The phase angle associated with this integral factor is -90 × n. There's also an all-number. First order factor 1/ (1+jωT): This factor has an inclination of -20 dB per decade. The corner frequency corresponding to this factor shall be 1/T radioed per second. The phase angle associated with this first factor is -tan– 1(ωT). First order factor (1+jωT): This factor has an inclination of 20 dB per decade. The corner frequency corresponding to this factor shall be 1/T radioed per second. the phase angle associated with this first factor is tan– 1(ωT). Second order or square factor : [{1/(1+(2 bom/ω)} × (jω) + {(1/ω2)} × (jω)2)]: This factor has an inclination of -40 dB per decade. The corner frequency corresponding to this factor is ωn radan per second. The phase angle associated with this first factor is how to draw bode plotTranspassing all the above points in mind, we are able to draw bode clap for each type of control system. Now let's discuss the Boda plot process:Replace with = jω in the open loop transfer function G(e) × H(e). Find the appropriate erote frequencies and tabuliš them. We now need one semi-log graph to select the frequency range so that the plot should start with a frequency lower than the lowest er per cent frequency. Mark the eroze frequencies on the X-axis, indicate the inclination on the left side of the y-axis by marking the slope of the inclination in the middle and on the right side of the side mark phase angle with -180o in the middle. Calculate the profit factor and system order type. Now calculate the inclination that corresponds to each factor. To draw boda-size tiles:Mark the corner frequency on paper with a graph pollogram. Tabunc these factors, moving from top to bottom in a given sequence. Permanent expression K.Integral factor First order factor First order factor (1+jωT). Second order or square factor:Now sketch the line using the corresponding inclination of a given factor. Change the inclination at each corner frequency by adding the inclination of the next factor. You're going to get a conspiracy. Calculate the profit margin. To draw a Bode phase plot:Calculate the phase function to add all stages of factors. Substitute different values of the above function to determine the stage at different points and plot the culpa. You're going to get a phase curve. Calculate the phase margin. Bode stability criterion Stability conditions are given below:For a stable system: both margins should be positive or the stage level should be greater than the profit margin. For a marginally stable system: both margins should be zero or phase margins should be equal to profit margins. For unstable System: if any of them are negative or the stage rate must be less than the profit margin. The advantages of The Bode PlotTo is based on an asymptotic approximation, which provides a simple method for plotting the culpa of logaritam magnitude. Reproduction of various magnitudes occurs in the transfer function can be considered as an adjunct, while the division can be treated as a subtraction as we use a logarithm scale. With the help of this plot, we can comment directly on the stability of the system without making any calculations. The bode plans provide relative stability in terms of profit margin and phase margin. It also covers from low frequency to high frequency range. NPTEL Assignment -9 Answers: Control Systems 2020 V the size of the Bode surface is the magnitude of the sinusoidal transfer function P(jω) expressed as log10| P(jω)|20log10| P(jω)|10log10| P(jω)|2log10| P(jω)| 2. Which of the following characteristics is not correct with regard to the use of the logarithm scale to show the frequency in the Bode plot? A larger frequency range may be represented Lower frequency ranges may be extended The zero frequency can be represented If point C is exactly halfway between points A and B, the frequency value in point C is the geometric mean of the corresponding values in points A and B 3. If the plant transfer function is expressed as f(s)/ g(s), the magnitude (in dB) of the plant sinusoidal transfer function is log10|f(jω)|+log10|g(jω)|20log10|f() jω)|+20log10|g(jω)|log10|f(jω)|−log10|g(jω)|20log10|f(jω)|−20log10|g(jω)| 4. In problem 3, the phase (in °) of the sisoid transfer function of the plant log10(∠f(jω)+log10(∠g(jω))log10(∠f (jω)−log10(∠g(jω))∠f(jω)−∠g(jω)∠f(jω)+∠g(jω) 5. Note P(e) = 100. Then the magnitude (in dB) and phase (in °) of the corresponding sinusoidal transfer functions are 40 and 180 40 and 0 -40 and 0 -40 and 0 -40 and 180 6, respectively. The slope of the magnitude plot (in dB/octa) jωjω is 7. The corner frequency (in rad/s) of the 1/ 4s+1 transmission function is 8. The magnitude (in dB) of the sinusoidal transmission function corresponding to problem 7) because the frequency tilts to zero is 9. The phase (in °) of the sinusoidal transmission function corresponding to problem 7) at the corner frequency is 10.The ant frequency (in rad/s) of the 4s+24s+2 transmission function is 11. The magnitude (in dB) of the sinusoidal transmission function corresponding to problem 10), as the frequency is tilted to zero, is 12. The phase (in °) of the sinusoidal transmission function corresponding to problem 10) at the corner frequency is 13. Note the plant whose transmission function is 1/ s2+3s+6 Magnitude (in dB) low frequency asymptote in the plane level of the corresponding sinusoidal transmission function is 14. For problem 13, the corner frequency (in rad/s) of the sinusoidal transmission function is 15. For problem 13, the resonant frequency (in rad/s) of the sinusoidal transmission function is 16. Observe system 1 and system 2, the functions of which are s+3/ s+4 and 3−s/ s+4. Which of the following statements is FALSE about the relevant sinusoidal transfer functions? High frequency magnitude of the sinusoidal transmission function of system 1 inclined to 0 dB The high frequency magnittude of the sinusoidal transmission function 2 shall be inclined to 0 dB The high frequency phase value of the system transmission sinusoid function 2 has, for consequence, 0° High frequency value of the sinusoidal transmission function 1 has 0° 0°

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