Experiment #5

Frequency Domain Analysis of Systems Using the Program MATLAB

1. Preliminary Work

1.1 Give a brief description of the gain margin and the phase margin. Give some sample bode plot drawings to explain the two concepts.

1.2 Give definitions of the cut-off frequency and the bandwidth. Give drawings to explain the two concepts.

1.3 In the calculation of the gain and phase margins, do we use the open-loop or the closed-loop transfer function?

1.4 In the calculation of the cut-off frequency and the bandwidth, do we use the open-loop or the closed-loop transfer function?

2. Experimantal Work

The following stages will be carried out using the program MATLAB. Consider the system in the figure where the transfer function:

G(s) = K/s(s+0.1)(s+5)

2.1. Consider K=10.

2.1.1. Using the facilities of the program, obtain the bode plot for both gain and phase of G(s). Sketch or print this plot on your notebook. Calculate the phase and gain margin using the plot.

2.1.2. Obtain the frequency plot (bode plot) for the closed loop system. Sketch or print this plot on a sheet of paper. Calculate the cut-off frequency and the bandwidth using the plot.

2.2. Let K=100.

2.2.1. Repeat 2.1.1 for this case.

2.2.2. Repeat 2.1.1 for this case.

3. Results and Conclusions

3.1. Compare the results you have obtained for K=10 and K=100.

3.2. Comment on the stability of the system in the figure for two values of K.

3.3. Summarize the conclusions derived resulting from the experiment.