ME 360: FUNDAMENTALS OF SIGNAL PROCESSING, INSTRUMENTATION, AND CONTROL

Experiment No. 5
System Identification with Frequency Response Techniques using the Dynamic Signal Analyzer
Pre-lab Questions

These short answer questions must be completed and turned in at the beginning of the laboratory period.

1. What numerical method does the dynamic spectrum analyzer use to determine the discrete spectrum of an input signal? (3 pts)

2a. Use the data below in a MATLAB script to create a Bode plot. This is the magnitude (in dB) and phase (in degrees) of a first order system driven at the given frequencies. (9 pts)

Frequency (Hz)	Magnitude (dB)	Phase (Degrees)
0.0100	21.5833	-0.5156
0.0400	21.5780	-2.0597
0.1000	21.5486	-5.1428
0.2324	21.3977	-11.8119
0.6179	20.4134	-29.0785
1.0000	19.0068	-41.9872
2.4297	13.9630	-65.4251
6.4609	6.1663	-80.2421
10.0000	2.4455	-83.6598
11.6182	1.1564	-84.5371
20.8922	-3.9132	-86.9557
37.5691	-9.0016	-88.3060
55.5556	-12.3975	-88.8542
100.0000	-17.5018	-89.3634

2b. Find two approximations for tau from both the magnitude and phase plots. Make sure to draw on each plot how/where you found tau. (9 pts)

2c. Choose 3 frequencies from the data set and find K at each of those points. Hint: solve the equations in 5.2.4 for K in terms of f_b, f and the corresponding G[dB]. (9 pts)