

Project (3)

Due: 12.30 PM, Friday 21 April 2005

Late projects incur a penalty for each 24-hour period.

In this project you are designing **computationally efficient GLP FIR** digital filters to meet – in addition to being GLP – the magnitude specifications below

SPECIFICATIONS (all digital domain frequencies are fractional frequencies).

Passband ripple: ± 0.008 (note that: this is linear scale)

Lower and upper passband cutoff frequencies: 0.17 and 0.31

Stopband ripple: -56 dB

Lower stopband and upper stopband cutoff frequencies: 0.0625 and 0.42.

For each of the following show all steps and arguments. Make observations and contrast them with your expectations. Comment on the path your design process took for each of the following methods, in particular on observations made and actions taken.

1. Design a filter using **window-based** design of GLP FIR filters that meets all of the specifications. First, use fixed window, then use *Kaiser* adjustable window. Write and illustrate with plots how this method works for your final design.
2. Use Matlab to design a filter that meets the specifications with **frequency sampling** technique. Discuss the theory of the method for your final design.
3. Design an optimal GLP FIR filter using **the optimal method** with Matlab module (*remez* or *firpm*). Discuss how this Matlab commands work with a flow chart.
4. Compare and Discuss the tradeoffs of all of the above filters including the filter you obtained from project 2 – part 2.

Part 2:

Choose your favourite GLP FIR design, from the above, to verify your design using Matlab routine. Apply two input signals; each is a single tone (select first tone to be in the passband and the second tone to be in the stopband). Contrast the output result of the two cases.

(Projects Demo and Combined Projects Report)

- 1) **Written report (with a summary and conclusion) includes all projects** that you have done during this course (1, 2 and 3).
- 2) **Projects Demo:** Arrange a time slot to present your project report to the instructor. Individual meetings at office 644 Whitmore building will be held from **April 24 to April 28** for presenting the project report and do projects demo. Best project reports will be presented to the rest of the class.