**Laboratory Report Cover Sheet
DeVry University
College of Engineering and Information Sciences**

**Course Number:** ECET350

**Professor:**

**Laboratory Number:** 5

**Laboratory Title: Infinite** Impulse Response Band Pass Filter

**Submittal Date:** Click here to enter a date.

***Objectives:*** Design a high-order, FIR band pass using MATLAB and then to implement, test, and analyze the real-time performance of that filter on a target embedded system board. In addition, introduce and compare the numerical formats and processing requirements of digital filters when implemented using floating point versus fixed point mathematics on an embedded system.

***Results:* Summarize your results in the context of your objectives.**

***Conclusions:* What can you conclude about this lab based on your results?**

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| ***Student:*** |  |  |  |  |  |
|  | Name |  | Program |  | Signature |

**Filter Design Graphs, Tables, and Listings: Paste your answers in the spaces provided.**

Graph 1: FIR Band Pass Filter Frequency Magnitude Response Graph

Graph 2: FIR Band Pass Filter Phase Response Graph

Listing 1: FIR Band Pass Filter Coefficients

Data Table 1: FIR Band Pass Frequency Response

Graph 3: Measured FIR Band Pass Filter Phase Response Graph

Data Table 2: FIR Filter Pass Band Ripple Response

Graph 4: Measured Pass Band Response of FIR Band Pass Filter

**Questions**

1. What is the maximum dynamic range of a 16-bit, fixed-point number in decibels?

2. What is the equivalent decimal numerical precision of an unsigned, single-precision, floating point number?

3. Given that a 16-bit fixed-point, integer 15 coefficient filter with a sampling frequency of 2.0 kHz took about 38 µs to perform FIR filtering operations and left 462 µs for the micro to perform other tasks, what would you estimate the maximum number of coefficients that could be used on the 9S12 sampling at 2000 Hz and still finish all convolution calculations before the sampling period expired and the next input sample was ready?

4. What is the measured pass band ripple, δp, of your filter?

5. What is the measured gain at the upper frequency edge of the pass band, 20log(1 - δp) (dB)?

6. What is the measured upper frequency pass band edge frequency (Hz), fp1, of your filter?

7. What is the measured upper frequency stop band edge frequency in (Hz), fs1, of your filter?

8. What is the measured upper frequency transition width (Hz) of your filter?

9. What is the upper frequency minimum stop band attenuation, δs, of your filter?

10. Review the overall measured response of your filter, and explain any differences from the design specifications noted in the previous questions.

***Grade:***

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| **Deliverable** | **Points Available** | **Points Achieved** |
| **Data Measurements** | 10 |  |
| **Graphs (labels, accuracy)** | 10 |  |
| **Answers to Questions** | 10 |  |
| **Organization (format of results and style)** | 10 |  |
| **Total Points** | 40 |  |
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| Comments: |

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