Exp05: Multirate Signal Processing - Answer Book

- **Name:** **Lab Date:**
- **Student No.:** **Day of the week:** **Time:**
- **Name:** **TA Signature:**
- **Student No.:** **Grade:**

3. Experiment

3.1 Decimating and Interpolating

- *As you run your system, you will notice that the output does not like exactly like the input. Why is this the case?* [1 pt]

- *What other blocks or subsystems you will need in order to recover the original signal? Add to your model and show it running to the TA.* [1 pt]

- *Now that you have a better representation of the original signal, why is the output offset/delayed?* [1 pt]

3.2 Designing Mirrored Filters

- *Show the TA the impulse responses of the two filters you have designed. Plot them overlapping each other.* [1 pt]

- *Show the TA now the frequency response of the two filters. Use actual frequency values on the x-axis and dB (Decibels) on the y-axis.* [1 pt]

- *If you were to write a C function to implement the filtering through convolution, how would you minimize the use of memory to store the coefficients of both filters?*[1 pt]

3.3 A One Stage Multirate System

- *Using a discrete impulse as an input, what is the offset/delay needed to recombine the signal? What else could be used instead of a pure delay block?*[1pt]

- *Using a bandlimited white noise block as input, vary the gain from 0.1 to 10. Be sure to use 48KHz as your sampling rate. Explain to the TA what is happening.*[1pt]

3.4 A Multi-stage Multirate System

- *For comparison, design an FIR filter of order 60, f_s = 48KHz and f_c=2KHz. Compare the band selection of this filter you have designed with the selection obtained with the multi-stage design you are running. Is an order 60 comparable in performance (cutoff)? Which one takes longer to run? Which one takes more memory?*[1pt]

- *Place slider gains at multiple signal paths and show the TA which bands the sliders are affecting*[1pt]