

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

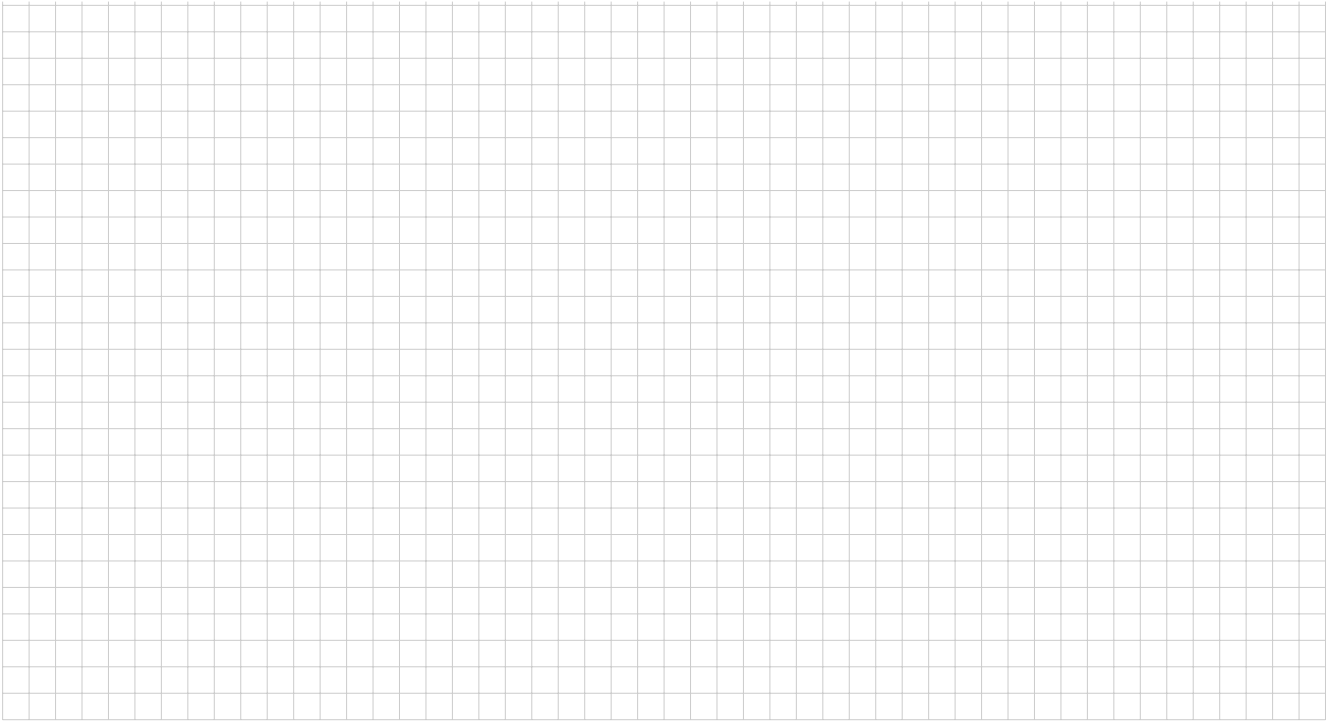
- As you run your system, you will notice that the output does not look exactly like the input. Why is this the case? [1 pt]

- 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]

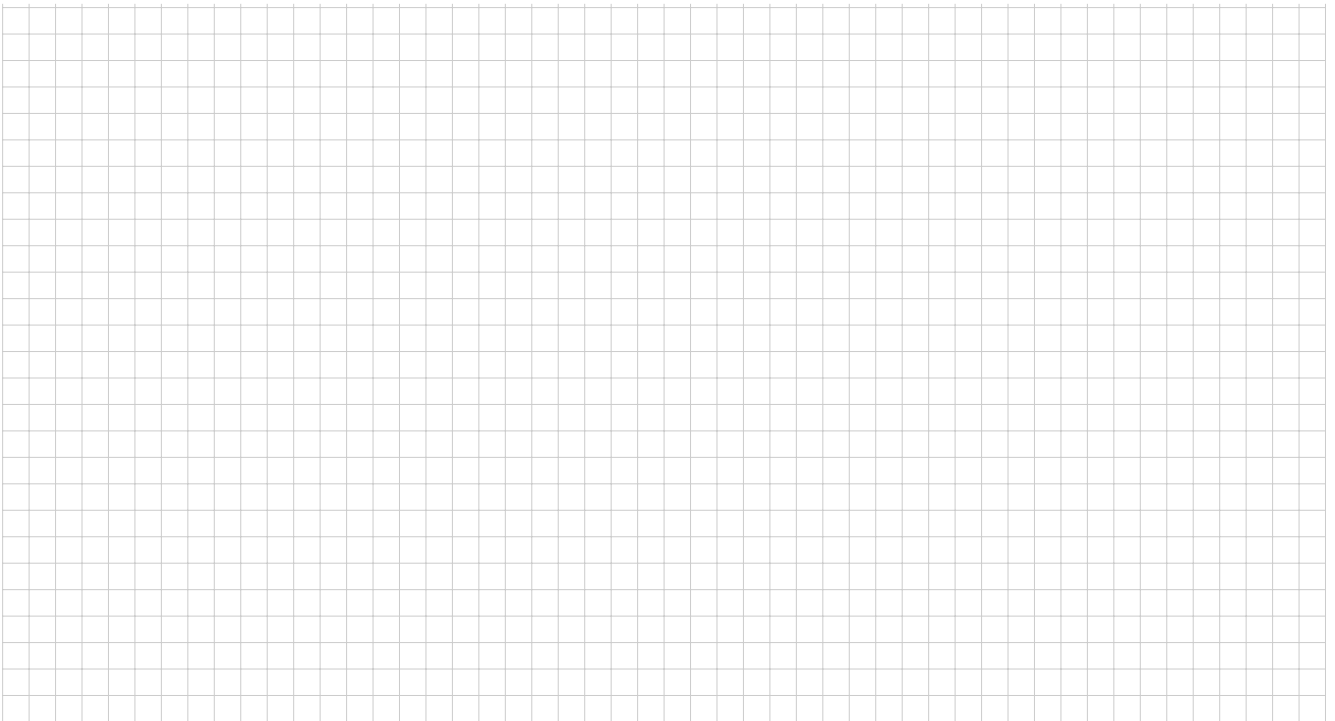
- Now that you have a better representation of the original signal, why is the output offset/delayed? [1 pt]

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, $f_s = 48\text{KHz}$ and $f_c = 2\text{KHz}$. 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]