

Lab 5 Report and Grading Format PCM Encoding and Decoding

1 Report Format

1. Briefly explain the procedure (what you did in the lab)
2. Show the Results/plots, you can use excel or a snap shot or draw it by hand. If you draw it by hand, it might be cumbersome. Following are some general guidelines. You dont have to follow the same format, but it will be good to see these results/plots.
 - (a) Generate the PCM signal for an input of 0V and for two other voltages (say +1V and -1V) for the following three cases
 - i. 7-bit linear
 - ii. 4-bit linear
 - iii. 4-bit compand
 - (b) Apply the PCM signal to the PCM decoder and check the output. Does it match with the input
 - (c) Repeat the above procedure with a sinusoidal input, generated by SYNC MESSAGE of the PCM ENCODER
 - (d) PLEASE NOTE: The plots should show the FS signal, otherwise the PCM results would not make any sense
 - (e) Show the output (for the sinusoid) when PCM ENCODER is set to 4-bit Linear encoding scheme and the decoding scheme of the PCM DECODER is different. The result should be different
 - (f) You may want to set the oscilloscope to SINGLE SEQ mode for the pictures
3. Matlab Code (print the code with the report and also send me the .m file, please save it as lab5_yourname.m)
 - (a) Generate a 2KHz sinusoid with a Peak to Peak Voltage of 2V ($\pm 1V$), and generate a quantized signal when $M = 8$ and $M = 16$ levels. Calculate SQNR, Signal to Quantization Noise Ratio.
 - (b) Comment on the matlab commands you used in the code and Justify why you used these particular set of commands. Please NOTE: Otherwise points will not be awarded.
4. Answer the following questions
 - (a) Define the following terms
 - i. PAM

- ii. PCM
 - iii. Companding, A-law, μ -law
 - iv. Quantization
 - v. Frame Synchronization (FS)
 - vi. Time Division multiplexing (TDM)
- (b) Block Diagram for PCM
- (c) List some of the Practical PCM circuits, and elaborate on any two circuits.
- (d) What is the Bandwidth of a PCM signal (its different for different pulses)
- (e) what are the terms
- i. Peak Signal Power to total Average Noise Power
 - ii. Average Signal power to Average Noise power,
 - iii. SNR and SNDR.
- (f) List and briefly elaborate the on the different categories of Quantization noise

2 Grading format

The lab will be graded for a total of 10 points.

1. 4 points for Steps 1.1 - 1.2
2. 3 points for Steps 1.3 (Matlab)
3. 3 points for Step 1.4 (for answering the questions)

3 Due Date/Extensions

The lab report is due in a week. But you can have extra time until Friday. I am not going to encourage any extensions beyond that point. From the feedback I received it seems some people are having issues to catch up. I suggest you submit whatever you have on Friday. You can always submit the parts for which you got less or no credit, later on during the course of the semester to get a MAXIMUM of HALF the points assigned.

You can work in groups but everybody should submit an individual report. If you are working with somebody, please list their names.

4 Feedback

I would appreciate if you take few minutes to write any comments about what you liked about the lab and what you didn't. It will be helpful if you can write this part on a different paper, so that I can collect it. It will be helpful for future labs (definitely for next year). Thank you.

5 General Comments

Thank you for all your comments. They have been very helpful. I will try to change the format (as much as I can) accordingly. From now onwards I will post questions with the handouts, you can ignore the questions listed in the handouts. I hope this avoids some confusion.

About MATLAB, these questions should take about half hour to an hour, if you are spending more time you should stop and see me. I am here to help. I will try to answer the questions. It will not be of much help if its only written in the lab section.

If you have any other questions/concerns, you can send me an email at vijay@ele.uri.edu or stop by the lab Kelly 201.