Digital Signal Processing Laboratory

(Spring Semester, 2020)

Date: 13-01-2020 and Duration: 120 Minutes

Experiment-01

Write **Arduino programs** for studying the performance of the moving average (MA) filter and first-order derivative filter as described below:

1. Moving Average Filter: $y[n] = \frac{1}{L}\sum_{k=0}^{L} x[n-k]$
2. Derivative Filter, first-order difference: $y[n] = x[n] - x[n-1]$
3. Derivative Filter, three-point central difference: $y[n] = x[n] - x[n-2]$

Note: The signals are sampled at 100 Hz.

a) Choose a filter to smooth out high frequency noises present in the signal.
b) Choose a filter to emphasize high-slope portions in the signal.
c) Design a MA filter with L=floor(0.8*N) to extract baseline drift component from a signal.
d) Find the output of signal processing system which performs derivative filter (2) and then perform MA filter with N=8.

MATLAB Programming (You can solve this now if you have installed MATLAB)

A. Sketch pole-zero plots for the MA filter with N=8 and the derivative filters
B. Sketch the magnitude response and phase response of filters

Homework (It should be solved before coming to the lab)

C. Find poles-zeros for the MA filter with length L=8 and the derivative filters using the Z-transform
D. Find the magnitude response and phase response functions of the above filters (Qns. 1-3)
E. Signal-flow diagram of the above filters (Qns. 1-3)
F. Determine whether the above filters are stable.

Viva-Voce Examination

Syllabus: Course topics covered in last class sessions and topics related to the above filters

1. Duration of viva-voce examination: 10 Minutes
2. If you score above 75% then you continue the lab experiment. Otherwise, you must prepare for the viva-voice exam to score above 75% as mentioned in the previous lab class.
3. You must complete the lab experiment within duration.
4. You must show the results of the experiment before you leave the classroom.
5. You must clarify your doubts during the lab duration. Course instructor is not responsible if you fail to clarify your doubts in classroom.
6. If you are absent you must complete the lab experiment on Sunday of that week.
7. You must bring the homework notebooks to show solutions for the HW questions. If you fail to show before starting of the experiments you will not be allowed to carry out experiment.