Birla Institute of Technology & Science, Pilani, Rajasthan
Second Semester 2018-2019
Lab Exams
(Open Book)

Course no.: EEE F434 **Course title: Digital Signal Processing**
Max. Duration: 2 Hours **Max. Marks: 10**

Date: 25-04-2019

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1. Develop a Matlab function to generate time domain and frequency response of a digital lowpass FIR filter with the specification $\omega_p = 0.35\pi$, $\delta_p = 0.15$, $\omega_s = 0.40\pi$, $\delta_s = 0.02$ by selecting an appropriate window function. Verify the design with Matlab functions fir1/fir2/FDATOOL.

   (3)

2. Using Matlab functions to design Butterworth and Chebyshev low pass digital filters with $\omega_p = 0.2\pi$, $\omega_s = 0.9\pi$, $\delta_p = 0.9$ and $\delta_s = 0.001$. Consider sampling frequency of 20 KHz.

   (2)

3. Design a second order linear phase FIR filters (low pass, high pass, bandpass, and bandstop). Plot the frequency response, phase response, and impulse response. Compare the phase response of the linear-phase second order low pass FIR with a non-linear second order low pass FIR filter.

   (2)

4. Model a Weiner filter to cancel an external noise I_m using a correlated signal I_s received at a sensor. Assume that the coupling coefficient remains the same throughout the experiment. Also assume average Gaussian noise power equal at both the sensors.

   (a) Print estimated C and actual C.

   (1)

   (b) Vary the magnitude of the linear coupling coefficient C, and develop LMS tracking to update the coupling coefficient C. Plot the mean square of error $C - \hat{C}$ with respect to iterations.

   (1)

5. (i) Plot a discrete version of sine wave $x(t) = 2\sin(2\pi 100t)$ for a time duration of 1 sec. (ii) Plot $x(n)$ by up-sampling it with a factor 2 (iii) Plot $x(n)$ by down-sampling it with a factor 4. (iv) Plot all three using subplot.

   (1)