Signals, Systems and Modulations

Laboratory no. 1

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Documentation of laboratory work results

Task 1

Table 1:

N	transition band	passband ripple	stopband attenuation
16	0.0938	0.1577	-15.16
32	0.043	0.186	-16.21
64	0.0234	0.1999	-16.65

Design of lowpass FIR filter by sampling in frequency domain

Influence of N on transition band
As N increases, the transition band gets smaller.

Does passband depend much on N? What is the difference between the minimum and maximum values of passband ripple that we have observed?
Ans2

Does the stopband attenuation depend much on N? What is the difference between the minimum and maximum values of stopband attenuation that we have observed?
Ans3

Number of DFT points needed to be used to obtain transition band ¡ 0.05
Ans4

How do zeros of the transfer function influence frequency response of the filter
Ans5

Design of a lowpass FIR filter by windowing in time domain

What is the period?

The period of the spectrum is the inverse of the sampling frequency (1/40kHz), which is equal to 25 microseconds

Task 2

Comparison of results with results of sampling in frequency domain

Is it possible to obtain the stopband attenuation ¿ 30dB? Ans6

What is the influence of window shape on transition band? Ans7

Table 2:

N	transition band	passband ripple	stopband attenuation
16	0.0938	0.1577	-15.16
32	0.043	0.186	-16.21
64	0.0234	0.1999	-16.65

Table 3:

window	transition band	stopband attenuation
rectangular	0.0312	-21.46
Hamming	0.1094	-52.66
Blackman	0.1445	-76.66

What is the influence of window shape on stopband attenuation Ans8

Window and its lenght N to obtain the stopband attenuation ¿ 70 dB and transition band ¡ 0.05. Ans9

Task3

Observation of a lowpass IIR Butterworth filter

Are there ripples in passband and in stopband?
Ans10

Where are zeros ot the transfer function?
Ans11

Where are the poles?
Ans12

What is the influence of the cutoff frequency on zeros and poles?
Ans13

Task4

Design of a lowpass IIR Butterworth filter

Table 4: Simulation of Butterworth filter

Number of zeros and poles	transition band
8	0.289
16	0.1582
32	0.084