

AV331: Digital Signal Processing

Labsheet 9

Filters and Hilbert transform

1. In a speech recording system with a sampling rate of 10kHz, the speech is corrupted by broadband random noise. To remove the random noise while preserving speech information, the following specifications are given:

speech frequency range = 0 - 3000 Hz

Stopband range = 4000 – 5000 Hz

Passband ripple = 0.1 dB

Stopband attenuation = 45 dB

Determine the FIR filter length (number of taps) and the cutoff frequency; use MAT- LAB to design the filter and plot the frequency response.

2. Design a 25 tap Hilbert transformer with cutoff frequency 0.4π rad/ sample using:

a) Rectangular window

b) Hamming window

c) Blackman window.

Plot the frequency response. Also plot the output of the Hilbert transformer for a sinusoidal input.