Chapter 4: Convolution and FIR filtering.

All review Topics for Exam-2.

Digital audio effects. Delays, echoes, comb filters, reverberators, multi-tap delay algorithms. Circular buffer implementations.


Determining the minimum signal length required to achieve a desired frequency resolution, with rectangular, Hamming, or Kaiser windows.

What is an N-point DFT? What is the meaning of the N computed DFT values? What are the DFT frequencies in Hertz? Computational versus physical resolution.

How do you map negative frequencies onto positive DFT frequencies, or onto positive DFT indices?

Effect on the DFT of padding zeros at the end or the beginning of a signal.

Given a linear combination of sinusoids, predict at what DFT indices you are going to get peaks in the DFT spectrum and estimate the frequencies of the sinusoids from the DFT.

Computing inverse N-point DFTs, using \([\text{DFT}(X^*)]^* / N\) or \([\text{FFT}(X^*)]^* / N\).

Given a linear combination of sinusoids, determine the DFT without performing any DFT/FFT calculations. Method: compare terms with the inverse DFT formula. Conversely, given the DFT, express the signal as a sum of sinusoids.

Filtering a periodic signal \(x(n)\) of period \(N\) through a stable filter and determining the periodic steady-state output \(y_{\text{stead}}(n)\). Using DFT/FFT and IDFT/IFFT methods.

How can you compute very large FFTs from smaller ones?

Computational cost of the FFT. Derivation of computational cost.

Computing up to 8-point FFTs and IFFTs by hand.

Second-order digital parametric equalizer design, including notch filters, using the bilinear transformation.

**Reading Materials:**

chapters 4–7, sections 8.2.1–8.2.4, 9.1–9.8, 10.2.2, and 11.1–11.4.

**Preparing for the final:**

The final is comprehensive and the questions may blend material from different chapters. To prepare properly for the final, you need to review all: (a) examples in class, (b) examples in text, (c) assigned and non-assigned homework problems, and (d) old exam problems. Good luck.