Digital Signal Processing 1-2 Quiz

(1) Multiplication in the frequency domain is equivalent to __Convolution_ in the time domain?

(2) Fill in the missing equations

Autocorrelation

$$R_{f,f}(\tau) = \sum_{n=0}^{N-1} f[n]f[n+\tau]$$

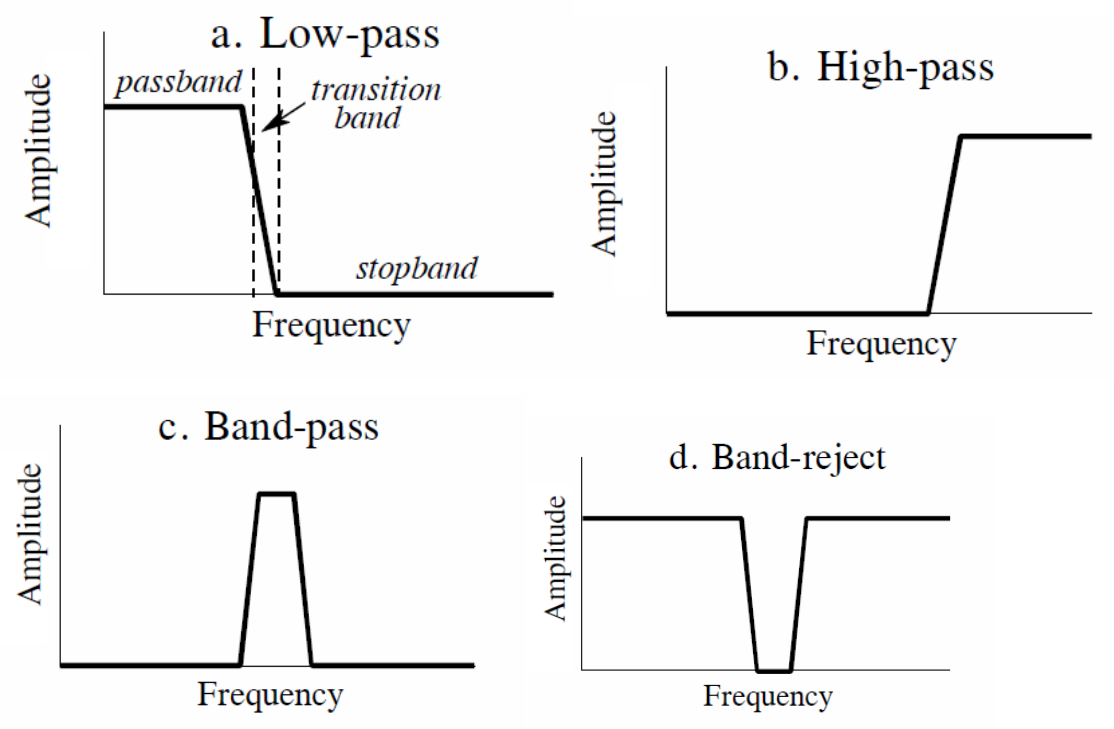
Cross-Correlation

$$R_{f,g}(\tau) = \sum_{n=0}^{N-1} f[n]g[n+\tau]$$

Convolution

$$C_{f,g}(\tau) = \sum_{n=0}^{N-1} f[n]g[n-\tau]$$

(3) Draw and label the frequency response curves for a low-pass, high-pass, band-pass, and band-stop filter



(4) Describe a Morlet Wavelet.

A Morlet wavelet is sinusoid convolved with a Guassian, or slightly more accurately it is a complex exponential multiplied by a Guassian in the frequency domain. It is itself complex and guassian in both time and frequency domains. As such, it is defined buy its standard deviation in time or frequency.

Important points:

- It is complex
- It is a combination of a sinusoid and a Gaussian
- It is Gaussian with respect to time for both amplitude and frequency
- Decent drawings count for points

(bonus) List three consequences of zero-phase filtering

- Cannot be performed on-line
- The filter magnitude (gain) is squared
- The effective filter order is doubled
- Causality can no longer be assumed