Quiz 1 Review

Quiz covers material from Chapter 1 (Unit 1). The intent is to cover the basics that you should know without looking things up. If you prepare well, you will have plenty of time.

Know the inter-relationships of the basic parameters:

$f_s, \Delta t, N, T, \Delta f$

Quiz 1 Review

Know the equations for the basic transforms (time to linear spectrum; linear spectrum to time):

$$X_m = \sum_1 x_n e^{-j 2\pi \frac{nm}{N}} \Delta t$$

$$x_n = \sum_1 X_m e^{j 2\pi \frac{nm}{N}} \Delta f$$

Know how these transforms look for the special cases, n = 0 or m = 0.

Know the units (or how to figure them out).

Quiz 1 Review

Know how to relate the basic transforms to the fft and ifft functions:

$$X_m = \mathrm{fft}(x_n) \cdot \Delta t$$

$$x_n = \mathrm{ifft}(X_m) \frac{1}{\Delta t}$$

Know what the linear spectrum should look like for the normal case in which the time series is a series of real numbers. Know the complex-conjugate symmetry and the order of points obtained from the MatLab-implemented transform. (Review Exercise 1.1)

Quiz 1 Review

Know how to construct the double-sided spectral density from the linear spectrum.

$$S_{xx} = \frac{1}{T} X^* X = \frac{1}{T} |X|^2 \; ; \; m = 0 : N-1$$

Know the difference between our equation notation (e.g., m) and indexing a MatLab vector: first value in the MatLab vector is indexed with a one but is the m=0 (or n=0) value.

Quiz 1 Review

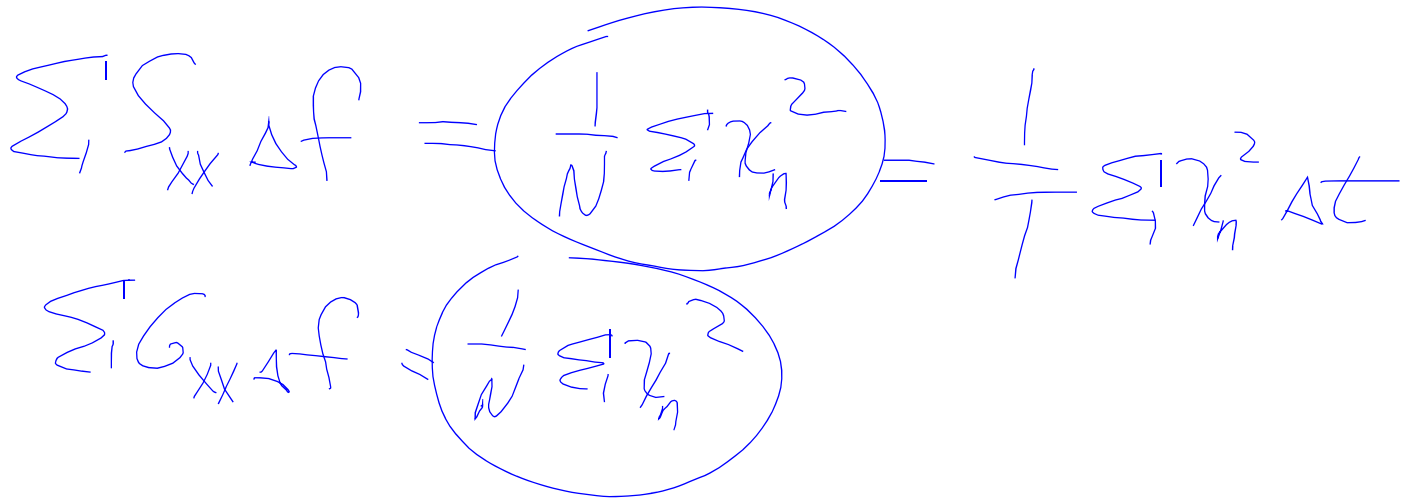
Know how to construct the single-sided spectral density from the linear spectrum.

$$G_{xx} = \frac{2}{T} X^* X \; ; \; m = 1 : \left(\frac{N}{2} - 1\right)$$

$$= \frac{1}{T} X^* X \; ; \; m = 0, \frac{N}{2}$$

Quiz 1 Review

Know the relationship between the “integral” of the spectral densities and the mean-square value in the time domain. (Know how to calculate these quantities by hand.



Quiz 1 Review

75-minute duration for quiz

Closed-book, closed-notes quiz: no reference material allowed.

Put your answers on the quiz sheets in the spaces provided.

You must give units for your answers. If dimensionless, indicate that.

Bring a calculator (smart phone app is acceptable as calculator).

For resident students: proctor will not questions about the quiz. (The DE students can't ask or hear answers so, to be fair, no questions during the quiz. If you have doubts about a part of the quiz, explain on your paper and do the best you can.)