In the name of God

Department of Physics
Shahid Beheshti University

NUMERICAL ANALYSIS COURSE

Exercise Set 11: Spectrum Analysis

(Due Date: 1403/10/10)

1. Using the data sets (0.2.txt, 0.5.txt and 0.8.txt), do following tasks:
A: Compute the Auto-Correlation function of mentioned data and by using the direct definition of discrete Fourier transformation, compute the power spectrum of each sets.
B: For each data sets, construct the $x(t) \rightarrow x'(t) = x(i) + 2\sin(3t) + 2\sin(50t)$ and then compute the power spectrum.

2. Use the random generator of computer (constant PDF) and generate 10000 data. Now according to the phase-randomized method, construct the surrogate data. Check the PDF your new data set.

3. Use the sunspot.txt data and derive the main period on that.

4. Use the sunspot.txt data, make a low-pass filtered data (keep only first 1000 Fourier coefficients and set the rest to zero) and then use inverse Fourier transform and compare your result with the original data.

5. Using the sunspot.txt data, make a High-pass filtered data (set the first 1000 Fourier coefficients to zero and keep the rest coefficient) and then use inverse Fourier transform and compare your result with the original data.

Good luck, Movahed