

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
COLLEGE OF COMPUTER SCIENCES & ENGINEERING

COMPUTER ENGINEERING DEPARTMENT

COE-341 – Data and Computer Communication

**Matlab Programming Assignment #1: Fourier Series Expansion
& Filtering – Due Date Nov 28th, 2010 – In Class.**

[100 points] Consider the periodic signal $s(t)$ shown in figure below. The corresponding Fourier series expansion and power spectral density function (PSD(f)) are computed as part of Assignment #1 (Problem 9) and Major Exam 1 (Problem 5).

- a) **[35 points]** Write a Matlab code to evaluate $s(t)$ and $s_e(n = k)$ for any $k = 1, \dots, \infty$. The code prompts the user to enter a specific value for k . The code should plot the original $s(t)$ and also the $s_e(n = k)$ for some k 's on the same plot. Use different line styles and colors (as the solution key for assignment 1) to identify the individual curves. Also use the "legend" command of Matlab to label the curves appropriately. The code should be general and takes the values of T , A , and k as inputs. Add the proper labels (x and y) as well.

In short, it is required to write a Matlab code that produces Fig.1 in the solution key for assignment 1. Note this is different than the Programming assignment requirement for previous semester!

- b) **[30 points]** Using the expressions for the total power of $s(t)$ and power of $s_e(n = k)$, the code should print out the total power of $s(t)$ as computed from the original expression of $s(t)$, the total power as computed from the developed $s_e(n=k)$, and the percentage of the latter relative to the former quantity. You should observe that the percentage approaches 100% as k increases.

In short it is required to generate a listing of power and percentages similar to that in the solution key for assignment 1.

- c) **[35 points]** Extend the Matlab code done for (b) to evaluate the PSD function for $s(t)$ as well. On a separate figure plot the PSD function for k 's up to 9. Utilize the "stem" Matlab command for plotting and label your axes properly.

The developed Matlab code should be very organized and well documented. Use variable names identical or very close to the mathematical variable used in this problem statement. The documentation should clearly specify the sections of the code that correspond to each part of this programming assignment.

Students are encouraged to cooperatively discuss the problem and the Matlab know-how, however, when it comes to writing the code, each student must write and submit his own code. The submitted codes will be inspected for similarities.

Generate the required outputs and import them into a Microsoft word file. Zip the word file together with the Matlab code and submit the zip file by email to: nahar@kfupm.edu.sa (Our TA Eng. Khalid Nahar) and ashraf@kfupm.edu.sa (The instructor). The name of the zip file should contain the following pattern: sXXXXXX_LastName_FirstName_ProgAssig1.zip. sXXXXXX is the student number.

To import figures into your word document, go to the Matlab figure Edit menu and select “copy figure”. Paste (special) the figure into the word file as “Picture (Enhanced Metafile)”. Please do not paste as any other format.

Students must ALSO submit a hardcopy of the programming assignment solution and the used Matlab code.

