BIRZEIT UNIVERSITY

Electrical and computer engineering

Digital Signal Processing (DSP)

Assignment No (1)

Submission deadline: **Saturday 19/9/2015** only through Moodle (itc.birzeit.edu)

Exercise 1.1:

Let $x(n) = \{1, -2, 4, 6, -5, 8, 10\}$. Generate and plot the samples (use the stem function) of the following sequences.

$\uparrow$ n=0

a. $x_1(n) = 3x(n+2) + x(n-4) - 2x(n)$

b. $x_2(n) = 5x(5+n) + 4x(n+4) + 3x(n)$

c. $x_3(n) = x(n+4)x(n-1) + x(2-n)x(n)$

d. $x_4(n) = 2e^{0.5n}x(n) + \cos(0.1\pi n)x(n+2), \quad -10 \le n \le 10$

e. $x_5(n) = \sum_{k=1}^{5} nx(n-k)$

Exercise 1.2: For the three systems below, determine whether they are:

a. time-invariant
b. stable
c. causal
d. linear

$$T_1[x(n)] = \sum_{k=0}^{n} x(k); \quad T_2[x(n)] = \sum_{k=n-10}^{n+10} x(k); \quad T_3[x(n)] = x(-n)$$

Exercise 1.3 : For the two sequences below verify the commutation property (x1(n) * x2(n) = x2(n) * x1(n)). Use the `conv_m` function.

$x_1(n) = n[u(n+10) - u(n-20)]$

$x_2(n) = \cos(0.1\pi n)[u(n) - u(n-30)]$

Question 1.4: Use Matlab (or any programming language) for generating a one second discrete-time signal with three frequencies; 500Hz, 1.5KHz and 3.5KHz and sampling frequency Fs=8KHz. Display your signal using stem or plot functions.

Design and implement a moving average DSP system with a configurable window size. Tune filter window size so the cutoff frequency is equivalent to 2KH. Pass your signal (generated above) through this filter to get output signal. Display output signal and compare it with your input signal? Explain differences?