IET WINTER 2016
Semester-6
Digital Signal Processing

LAB 1

Objectives:

Understanding different concepts of signals and systems signal operations, sampling theorem using MATLAB script and Function.

Prerequisites:

- Basics of Signals and Systems, Signal Operations, Sampling Theorem

Important Notes:
- Plot results for problem (3) to (10) where input sequence and time index should be user defined.

Solve following Problem statements using MATLAB:

1. Generate deterministic continuous time signal having equation x(t)= 3t/(4+t^2) and discrete time signal having equation x(n)= 3n/(4+n^2)

2. Plot the continuous and discrete time sinusoidal wave for given amplitude, frequency, phase and sampling frequency.

3. Generate the function for signal addition. Add two sequences x$_1$(n) ={1,-1,2,5,1,5,-1} and x$_2$(n) ={-2,-8,9,4,2,3,5}.

4. Generate the function for signal multiplication. For Two sequences x$_1$(n) ={1,-1,2,5,1,5,-1} and x$_2$(n) ={-2,-8,9,4,2,3,5}.

5. Generate the function for timing shifting. For sequences x(n) ={1,-1,2,5,1,5,-1}.

6. Generate the function for signal folding. Fold the sequence x(n) ={1,-1,2,5,1,5,-1}.

7. Generate the function for time multiplication. Use it for sequence x$_1$(n) ={1,-1,2,5,1,5,-1}.

8. Generate function for unit sample signal $\delta(n)$. Also plot $\delta(n-1)$ and $\delta(n+1)$.

9. Generate function for unit step signal $u(n)$. Also plot $u(n-1)$ and $u(n+1)$.

10. Generate function for unit ramp signal u$_r(n)$. Also plot u$_r(n-1)$ and u$_r(n+1)$.

11. Find out the output of Accumulator if input x(n)=cos((2n*pi)/20)u(n).

12. Perform the operation on x(n)

$$x(n) = (1, \underset{\uparrow}{-1}, 2, 5, 1, 5, -1)$$

1) $\displaystyle\sum_{k=-1}^{3} x(k)$

2) $\displaystyle\prod_{k=-1}^{3} x(k)$

3) $Energy, E_x = \displaystyle\sum_{k=-\infty}^{\infty} x^2(k)$

13. Plot all the given signals and comment on their output for periodicity writing common MATLAB code.
    a. $X(n) = \cos(0.002\pi n)$
    b. $X(n) = Sin(30\pi \frac{n}{105})$
    c. $X(n) = Sin(5n)$
    d. $X(n) = \cos(32\pi \frac{n}{10})$
    e. $X(n) = 10 \cos(7n + \frac{\pi}{6})$
    f. $X(n) = 2e^{j(n-\pi)}$

14. Plot all the given signals and comment on their output for periodicity writing common MATLAB code.

$$(1) x(n) = 3\cos(\frac{n\pi}{6}) + 5\cos(\frac{3n\pi}{4})$$

$$(2) x(n) = \cos(\frac{n}{7})\cos(\frac{n\pi}{7})$$

$$(3) x(n) = \cos(\frac{n\pi}{6})\cos(\frac{n\pi}{9})$$

$$(4) x(n) = 2\cos(\frac{n\pi}{4}) - \sin(\frac{n\pi}{6}) + 3\cos(\frac{n\pi}{8} + \frac{\pi}{3})$$

15. Sample the sinusoid x = sin(2 pi f t), where f = 2 kHz, and plot the sampled signals over the continuous-time signal.

    - Let x1 be the signal sampled at 10 kHz.
    - Let x2 be the signal sampled at 3 kHz.

    Plot required waveforms and comment on the same by writing common MATLAB code.