Project 1 (due on Friday, October 25th)

Total Marks : 100

Class,

*Instructions: please prepare a zip file containing both the report and matlab file of project. The submitted file should have a name containing students last name and R number. In case of two students working on the project, the submitted file should be named with last names of both the students. You need to write separate MATLAB codes for part 1 and part 2.*

Project 1 has two problems to solve. Problem 1 is described in the book in detail as an example. Please go through it step by step.

**Part 1: (#30)**

It is to be submitted in the form of a project report along with the MATLAB code. You can do the project in groups of maximum two students. Make sure that names of both the partners along with their R number is written on the report. In this project we will implement a discrete time system and determine the system response. Please make sure you have signal processing toolbox available to you before starting this assignment. Try to explain every step you implement in 1-3 lines.

Part 1

In this part of the project, we represent a discrete time signal and do a few operations e.g. time shifting and scaling. Consider the discrete time function f[n] as follows

You can use MATLAB function *inline* to generate f[n].

* Plot f[n] for ( -10 <= n <= 10). You can use *stem* command for this.
* Plot f[-2n] for the same range of ( -10 <= n <= 10)
* Plot f[-2n + 1] for the same range of ( -10 <= n <= 10)

Part 2

In this part of the project, we will investigate system response. MATLAB’s *filter* command can help us understand system response for cases of our interest. Find the impulse response h[n] for a system described as follows:

y[n] – y[n-1] + y[n-2] = x[n]

* Plot h[n] for above system for the range of (0 <= n <= 30)
* What do you understand about BIBO stability of the system from the plot of h[n]?
* Plot zero state response y[n] for input . Assume the range to be (0 <= n <= 30)
* Plot zero input response y0[n] for given initial conditions, y[-1] = 1 and y[-2] = 2 for range (0 <= n <= 30).

Part 3

In this part of the project, we implement discrete time convolution operation using command *conv*. Let us assume that for the system defined in part 1 has an impulse response given as

let us assume the input give to the system as follows

Find the zero state response y[n] as convolution of x[n] and h[n]. plot y[n] over a range of (0 <= n <= 30).

**Part 2: (#70)**

**Problem 3.M-3.**