DSP LAB

**Question Combinations:**

1. MATLAB + MATLAB

**OR**

1. MATLAB + Simulink

**OR**

1. MATLAB + CC Studio

**Note: Example sequence, difference equations may change**

1) Write and execute a program using MATLAB to verify sampling theorem for a continuous time signal or of suitable frequency with respect to following conditions

i) Over -Sampling ii) Under- Sampling iii) Nyquist Sampling.

2) Using MATLAB find the response y(n) of a given LTI system whose impulse response **h(n) = [1, 2, 2, 1]** with time index (-1 : 2) for an input **x(n) = [1, 2, -3, -4]** with index **(-2:1).**

**( Different x(n) and h(n) may be given)**

3) Using MATLAB obtain the linear convolution of the two given sequences using DFT and IDFT method.

( **x(n)=[1,-1 ,1]** and **y(n)=[1, 2] or Different x(n) and h(n) may be given by Examiner)**

4) Using MATLAB obtain the Auto correlation of finite duration sequence and verify its properties.

**(Sequence will be given)**

5) Using MATLAB obtain the cross correlation of finite duration sequences Using convolution.

6 )Using MATLAB design and implement a digital **low pass** filter H(z) that when used in an A/D-H(z)-D/A structure gives an equivalent analog filter with following specifications

i) Monotonic Pass Band and Stop Band ii) Pass Band Ripple ≤ 3.01dB

iii) Pass Band Edge: 500Hz iv) Stop Band attenuation ≥ 15dB

v) Stop Band Edge: 750Hz vi) Sample rate of 2KHz

7) Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum using MATLAB.

**(Sequence will be given)**

8) Solve the following difference equation for y(n) making use of specified initial conditions and the input x(n). y[n] - (1/2) y[n-1] = x[n]; n≥0 and y[-1] = 1/4. Find the response of the system to the input x[n] = sin(0.5πn) using MATLAB.

**(Or any other difference equation, initial conditions and input may be given )**

9) Using MATLAB obtain the linear convolution of the two given sequences using DFT and IDFT method. **x(n)=[1, -1 , 1]** and **y(n)=[1, 2].**

**( Different x(n) and h(n) may be given by Examiner)**

10) Using MATLAB design and implement a **High Pass FIR Filter** using a **rectangular window of size N=5.** with the following desired frequency response.

**Hd() = 0 ; |w| ≤ π/4**

**= ; π/4 ≤ |w|≤π**

11)Design FIR Low Pass filter using Hamming window for the specifications given i)Pass band frequency 100 Hz ii)Stop band frequency 200 Hz iii) Sampling Frequency 1000 Hz

12)Using MATLAB design and implement a digital **low pass** filter H(z) that when used in an A/D-H(z)-D/A structure gives an equivalent analog filter with following specifications. i ) Ripple in Pass Band and Monotonic Stop Band ii) Pass Band Ripple ≤ 2dB iii) Pass Band Edge: 100Hz iv) Stop Band attenuation ≥ 20dB v) Stop Band Edge: 500Hz vi) Sample rate of 4KHz.

13) Using MATLAB obtain the circular convolution of the two given sequences using DFT and IDFT method. **x(n)=[1,-1 ,1]** and **y(n)=[1, 2].**

**( Different x(n) and h(n) may be given)**

14) A causal discrete LTI System is described by y[n] - (3/4) y[n-1] + (1/8) y[n-2] = x[n] where x[n] and y[n] are the input and output of the system respectively. Find the **Impulse response** h[n] of the system using MATLAB.

15) A causal discrete LTI System is described by y[n] - (3/4) y[n-1] +(1/8) y[n-2] = x[n], where x[n] and y[n] are the input and output of the system respectively. Find the **Step response** s[n] of the system using MATLAB.

16) A causal discrete LTI System is described by y[n] - (3/4) y[n-1] + (1/8) y[n-2] = x[n] where x[n] and y[n] are the input and output of the system respectively. Find the **response** y(n) of the system to the input x[n] = sin(0.5πn) using MATLAB.

**(Or any other difference equation ,initial conditions and input may be given**

17 ) Construct a Simulink model of a FIR LPF for given specifications and observe the time domain waveform and spectrum of filtered signal.

18) Write and verify a C program that obtains the circular convolution of two sequences x(n) and h(n) and realize using DSP Processor

**(x(n) and h(n) will be given)**

19) Obtain the impulse response of the given LTI system y[n] - (1/2) y[n-1] = x[n] using CC studio and realize using DSP Processor.

**(Or any other difference equation may be given )**

20) Write a C program to obtain the linear convolution of two finite sequences x(n) and h(n) and realize using DSP Processor.

**(x(n) and h(n) will be given)**

21) Find the N-Point DFT of a sequence **x(n) = [1, -2, -2, 1]** using CC studio and realize using DSP Processor.

**(Different sequence may be given)**

22) Construct a Simulink model of a FIR LPF for given specifications and observe the time domain waveform and spectrum of filtered signal.