**Introduction**

Introduction to MATLAB environment: Command Window, Variables, Constants, Scalars, Matrices and Vectors, Functions, Comments, Command History, Workspace, Editor, Script file etc.

**Experiment 1-A**

Write a MATLAB program to plot the discrete sine wave with given amplitude, frequency, phase, sampling frequency and length of the sequence. Also observe first alias.

**Experiment 1-B**

Write a MATLAB program for generation of DT unit impulse, step, and ramp sequence for a given initial time, final time and start of sequence.

**Experiment 1-C**

Write a MATLAB program for generation of an audio tone with given amplitude, frequency, phase,

sampling frequency and length of the sequence. Store it in .wav file with given sampling frequency and BitsPerSample, read back and play the audio file.

Use in-built functions: audiowrite, audioread, audioplayer, play.

**Experiment 2**

1. Find rational Transfer function H(z) = B(z)/A(z) of given DT LTI systems analytically.
2. Write a MATLAB program to find and plot pole-zero pattern in z-plane, to determine stability, to find and plot unit impulse and unit step responses, to find and plot magnitude and phase responses (Frequency response plots) if the given system is stable.
3. Accumulator

Z-1

x(n)

y(n)

1. Filter

1/3

Z-1

y(n)

-1/2

x(n)

Z-1

Note: Use inbuilt functions: tf2zpk, zplane, isstable, impz, stepz, freqz.

**Experiment 3**

1. Reverberation is similar to the echo effect we can hear when we shout across an open valley or canyon, or in a large empty room. The following figure gives one such model of reverberation. Find the transfer function and frequency response. Write a program to display its frequency response and impulse response.

0.8

y(n)

x(n)

0.9

Z-240

x1(n)

Note: Use inbuilt function: impz, freqz.

1. Apply an audio signal of suitable length to this filter containing mixture of tones at 100Hz, 500Hz, 1000Hz, 2000Hz and 4000Hz with equal relative magnitudes and sampled at 8000Hz. Plot and hear its input and output using headphone/ear phone/speaker.

**Experiment 4**

1. For M-tap moving average filter, plot the magnitude and phase response for different values of M using MATLAB.

Note: Use inbuilt function: freqz.

1. Write a MATLAB program to generate a signal x(n)=2n (0.95)n; 0≤n≤99. Corrupt it by additive random noise with amplitude in interval [-0.5 0.5]. Apply the signal to a Moving average filter with given tap length. Plot the input signal, noise signal, corrupted signal and filtered signal in same plot. Use proper labels and legends.

Note: Use inbuilt functions: rand, filter