Assignment 3

Decimation:

The process of downsampling an input sequence x[n], after passing through an Anti-aliasing filter is called Decimation.

The Anti-aliasing filter acts as an LPF with cut off frequency

|fc|<=(pi)/M, where M=down sampling factor

And Gain of the filter=1

The Anti-aliasing filter is used to avoid the aliasing of the spectral components which may occur due to the decrease in the sampling rate after down sampling a signal.

In decimation, the sampling rate is reduced from fs to fs/M by discarding (M – 1) samples for every M samples in the original sequence.

Interpolation:

The process of upsampling an input sequence x[n], before passing through an Anti-imaging filter called Interpolation.

The Anti-imaging filter acts as an LPF with cut off frequency

|fc|<=(pi)/L, where L=up sampling factor

And Gain of the filter=L

The Anti-imaging filter is used to avoid the unwanted replica of the spectral components which may occur due to the increase in the sampling rate after up sampling a signal.

In interpolation, the sampling rate is increased from fs to fs*L by padding (L – 1) zero samples for every L sample in the original sequence.

The inverse of interpolation is decimation but the converse statement need not necessarily be true always.

The cascade/combination of interpolation and decimation can be used to change the sampling rate of a input signal.