FACULTY OF ENGINEERING, UNIVERSITY OF JAFFNA

DIGITAL SIGNAL PROCESSING – EC5011

LABORATORY SESSION 4
UPSAMPLING AND DOWN SAMPLING

PRE LAB PREPARATION

A analog signal $x(t) = A_1 \sin(2\pi f_1 t) + A_2 \sin(2\pi f_2 t) + A_3 \sin(2\pi f_3 t)$, where $A_1 = 3000$; $f_1 = 1000\,Hz$, $A_2 = 2000$; $f_2 = 2000\,Hz$, $A_3 = 1000$; $f_3 = 5500\,Hz$, is sampled at 15kHz. Determine the sampled signal $x[n]$. Consider the following cases.

1) Down sampling by a factor of 3 without filtering.

2) Down sampling by a factor of 3 with filtering.

3) Up sampling by a factor of 3 with filtering.

4) Change the sampling frequency to 6kHz (use required filters)

a) Draw block diagrams for the above 4 cases and label the signals and sampling frequencies. Mark the cut-off frequencies (in Hz, and in radians) of any filters used.

b) Sketch the magnitude response of input, output and all intermediate signals having x-axis scaled to Hz for all the above cases.

c) Sketch the magnitude response of input, output and all intermediate signals having x-axis scaled to rad for the second and third cases.