**AV 331 : DIGITAL SIGNAL PROCESSING**

**Labsheet – 5**

*Spectral Analysis using DFT*

1. Consider the signal x[n] = cos(2πf1n) + cos(2πf2n) where f1 = 1/10 and f2 = 1/16.
   1. Observe the signal for 0 ≤ n ≤ 127
   2. Compute the 128-point DFT of x[n]; 0 ≤ n ≤ 63.
   3. Compute the 256-point DFT of x[n]; 0 ≤ n ≤ 63.
   4. Compute the 128-point DFT of x[n]; 0 ≤ n ≤ 79.
   5. Compute the 256-point DFT of x[n]; 0 ≤ n ≤ 79.

Observe the results and briefly write the inference.

1. Consider the signal x[n] = sin(2πf1n) + sin(2πf2n) where f1 = 0.34 and f2 = 0.28.
2. Compute the 128-point DFT of x[n]; 0≤ n ≤ 15.
3. Compute the 128-point DFT of x[n]; 0≤ n ≤ 15 by taking f2 = 0.29.
4. Compute the 128-point DFT of x[n]; 0≤ n ≤ 15 by taking f2 = 0.30.
5. Compute the 128-point DFT of x[n]; 0≤ n ≤ 15 by taking f2 = 0.31.

Observe the results and briefly write the inference.

1. Consider the signal x[n] = 0.5sin(2πf1n) + sin(2πf2n) where normalized frequencies, f1 = 0.22 and f2 = 0.26. Using a Hamming window, w[n] of length M=16
2. Compute the 16-point DFT of x[n]w[n].
3. Compute the 64-point DFT of x[n]w[n].
4. Increase M=32 and compute the32-point and 64-point DFT of x[n]w[n].
5. Now, again increase M=256 and compute 1024 -point DFT of x[n]w[n].

Comment on the changes in the spectral resolution and the spectral leakage in each case.

1. Let x(n)=[1 2 3 4 5 6 7 8] and X(k) denote the 8-point DFT of the sequence, x[n]. Compute the DFT of X(k) to obtain another 8-point sequence x1(n). Comment on the result obtained.