DIGITAL SIGNAL PROCESSING (CP-301)
Assignment No 3
CLO-3

<u>**Submission Date:**</u> 29-12-2021
<u>**Instructions:**</u>
- Individual Assignment

Q No 1: The signal $x_C(t)$ be given by

$$x_C(t) = 2\cos(650\pi t) + 4\cos(700\pi t) + 6\cos(750\pi t) + 8\cos(800\pi t)$$

(a) If $x_C(t)$ is sampled at $F_S = 801$ samples/sec, determine and plot the spectrum of the sampled signal as a function of frequency.
(b) If $x_C(t)$ is sampled at $F_S = 201$ samples/sec, determine and plot the spectrum of the sampled signal as a function of frequency.
(c) What is your observation of the baseband signals after sampling in each of the above two cases.

Q No 2: A bandpass signal has $F_L = 105$ Hz and $F_H = 145$ Hz. Determine the minimum sampling rate so as to have a minimum guard band of 10 Hz between two spectrum replicas. Draw the resulting spectrum over $[-150, 150]$ Hz range.

Q No 3: An 8-bit ADC has an input analog range of ±5 volts. The analog input signal is $x_C(t) = 2\cos(200\pi t) + 3\sin(500\pi t)$. The converter supplies data to a computer at a rate of 2048 bits/s. The computer, without processing, supplies these data to an ideal DAC to form the reconstructed signal $y_C(t)$. Determine: **(a)** the quantizer step size, **(b)** the folding frequency and the Nyquist rate, **(c)** the reconstructed signal $y_C(t)$.

Q No 4: Consider the signal $x[n] = 0.9^n u[n]$. It is to be downsampled by a factor of $M=3$ to obtain $x_d[n]$. **(a)** Compute the spectrum of $x[n]$ and plot its magnitude. **(b)** Compute the spectrum of $x_d[n]$ and plot its magnitude. **(c)** Compare the two spectra.