1. Write a Python program to find the spectrum of the following signal
   f = 0.25 + 2 sin($2\pi 5k$) + sin($2\pi 12.5k$) + 1.5 sin($2\pi 20k$) + 0.5sin($2\pi 35k$)

2. Explain and simulate Discrete Fourier transform (DFT) and Inverse Discrete Fourier Transform (IDFT) using Python.

3. Write a Python program to perform following operation – i) Sampling ii) Quantization iii) Coding.

4. Write a Python program to perform the convolution and correlation of two sequences.

5. Write a program to display the following region of a speech signal:
   i) Voiced region, ii) Unvoiced region, iii) Silence region.

6. Write a program to compute short term auto-correlation of a speech signal.

7. Let x(n)= { 1, 2, 3, 4, 5, **6**, 7, 6, 5, 4, 3, 2, 1}. Determine and plot the following sequences. y(n)=2x(n − 5) − 3x(n+4).

8. Design an FIR filter to meet the following specifications—Passsband edge=2KHz, Stopband edge= 5KHZ, Fs=20KHz, Filter length =21, use Hanning window in the design.

9. Creating a signals ‘s’ with three sinusoidal components (at 5,15,30 Hz) and a time vector ‘t’ of 100 samples with a sampling rate of 100 Hz, and displaying it in the time domain. Design an IIR filter to suppress frequencies of 5 Hz and 30 Hz from given signal.

10. Design a Lowpass filter to meet the following specifications—Passsband edge=1.5KHz, Transition width = 0.5KHz, Fs=10KHz Filter length =67; use Blackman window in the design.

11. Design a bandpass filter of length M=32 with passband edge frequencies f_{p1}=0.2 and f_{p2}=0.35 and stopband edge frequencies f_{s1}=.1 and f_{s2}=0.425.

12. Use a Python program to determine and show the “poles”, “zeros” and also “roots” of the following systems-
    H(s)= $\frac{S^3+1}{S^4+2S^2+1}$ b) H(s)= $\frac{4S^2+8S+10}{2S^3+8S^2+18S+20}$