Revision

1.The following analog signal $x_a(t) = \sin 480\pi t + 3 \sin 720\pi t$ (t in seconds) is sampled at 600 samples per seconds.

What is the folding frequency?

What is the discrete-time signal x(n)?

Can the original analog signal be constructed from x(n)? Why? if your answer is no compute the new analog signal?

2.Give reason why?

Low pass filter is usually needed before sampling a signal.
Non-linear phase shift causes signal distortion.
Ideal FIR filter cannot be reached.
DCT is suitable for data compression.

3.What happen if ?

Derivative of a signal is computed
Moving average is computed for a signal
An analog signal is sampled without being filtered first

4.Obtain the transfer function H (Z) and the difference equation for a **first order** high pass filter with cut off frequency equals 60 Hertz using BZT method. Assume sampling frequency equals 180 Hertz and Butter worth characteristics.

5.For the following discrete time system,

$$H(Z) = \frac{(Z+1)}{(Z-0.5)(Z-2)}$$

State whether this system is stable or not using poles & zeros stability analysis.
Without computing h(n), do you think it will converge or diverge?

6.For Y(n) = y(n-1) + x(n), state whether with justification Y(n) is a time variant or invariant system.

7.For $Y(n) = x(n^2)$, show with justification whether Y(n) is a linear or non-linear system.

8.Decompose the following signal into weighted shifted versions of unit sample sequence δ (n).

X(n) = {1, **2**, 0, 3}

9.If x (n) = 2 δ (n-1) - 3 δ (n+1) + δ (n+2), then find X (Z).

10.If X (Z) = Z^2 + 4 + 2 Z^{-1} +3 Z^{-3}, then find the sequence x (n).

11.If a signal ranged from 10 to 26 is quantized and encoded using 4 bits. What is the maximum quantization error ?

12.Obtain the coefficients of the FIR high pass filter to meet the specifications given below using the window method.

Pass band edge frequency	1.25 K. Hertz
Transition width	0.5 K. Hertz
Sampling Frequency	9 K. Hertz
Stop band attenuation	40 DB

13.Compute the fast auto-Correlation for the following periodic signal, given that its discrete Fourier transform as follows:

X (k) = {1, 1+j, 0, 1-j}

14.Given a signal with frequency band [8-32] and sampled at 128 HZ. Digital wavelet transform (DWT) is directly applied to the signal of 1 sec for 3 levels. using mother wavelet db1.

Draw the decomposition levels and show the number of samples and frequency band of each approximation and details part for each level.

Are the resulted wavelet coefficients of all parts necessary?? If no, which parts are necessary to maintain?