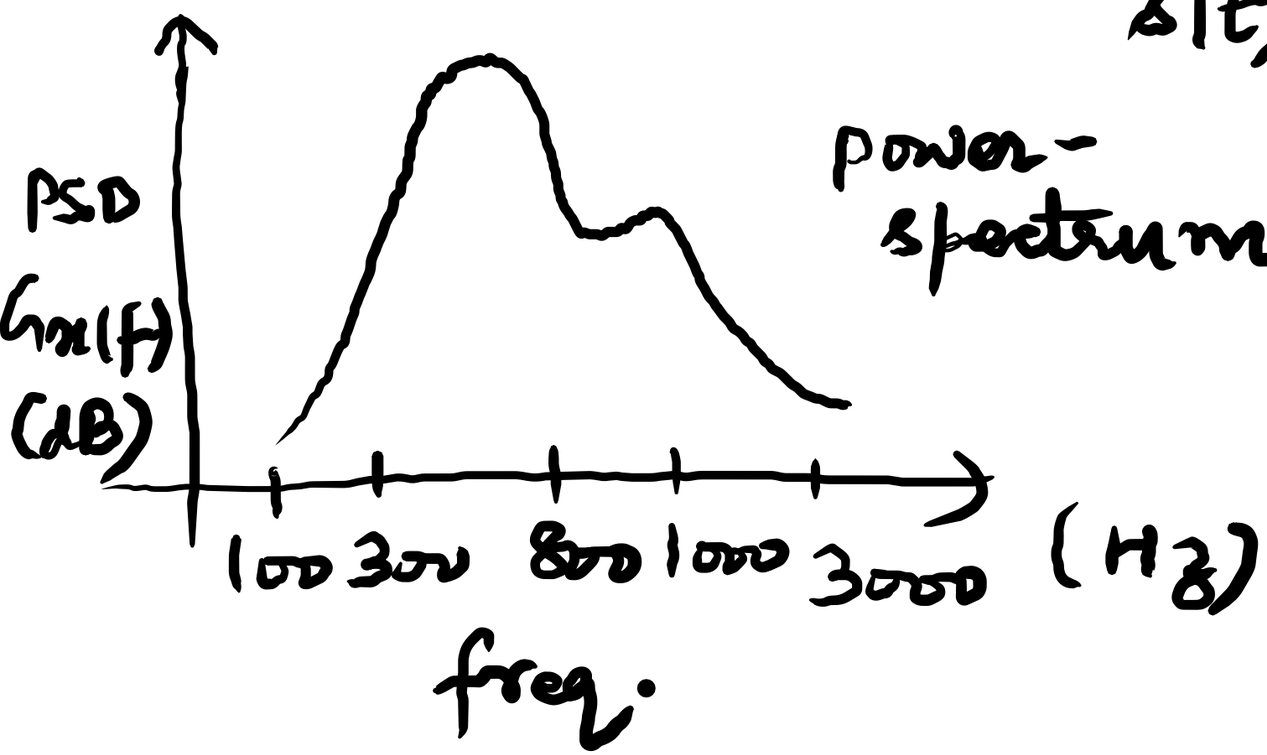
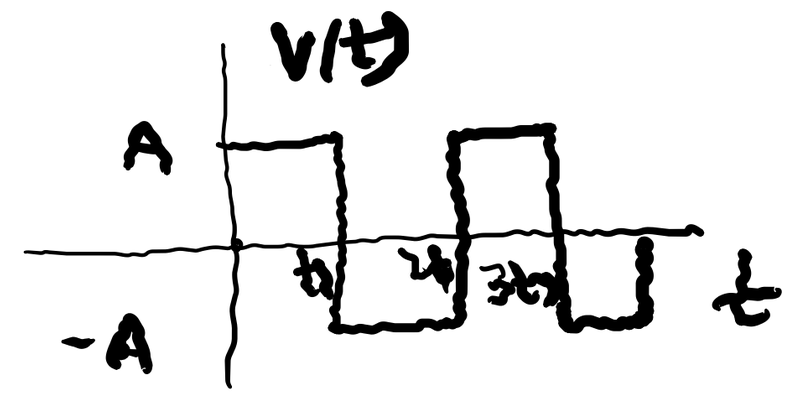
Lec-18, DC, 24-25, Sec-A

A short-term speech signal

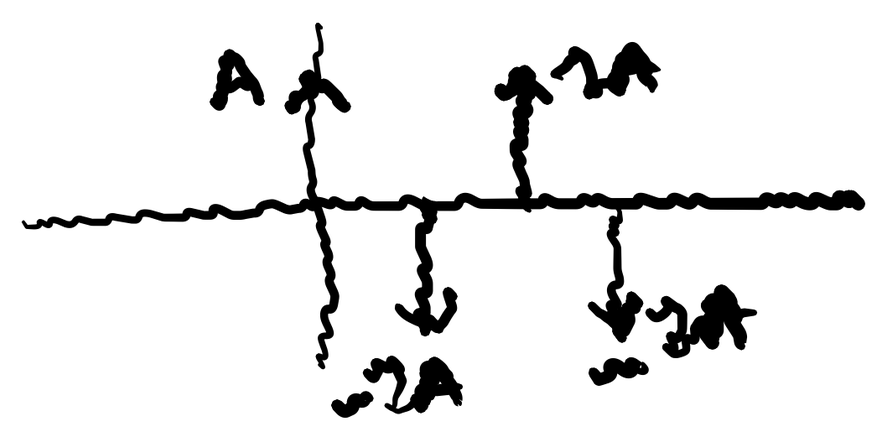
$s(t)$



power-spectrum



$\frac{d}{dt}(V(t))$



We can see that high freq- low amplitude, while, low-freq- high amplitude.

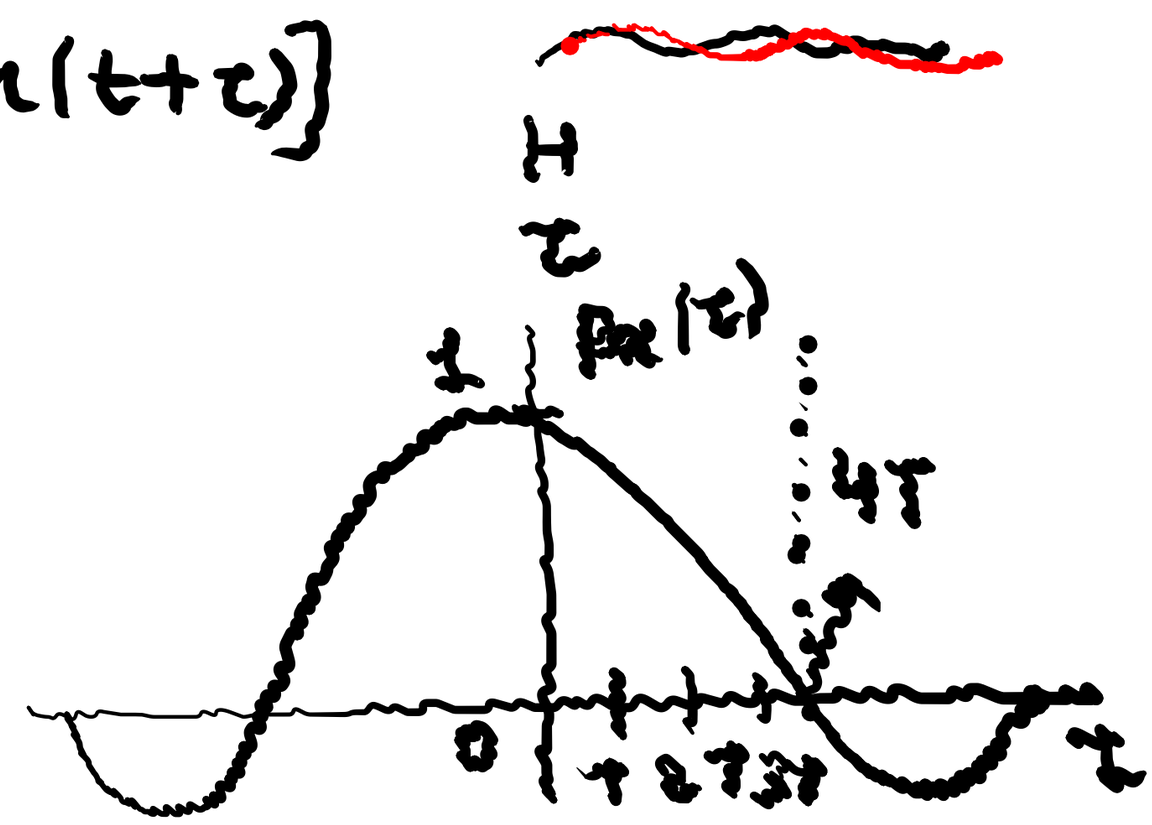
From power spectrum :- global maxima in the neighbor-hood of 300Hz to 800Hz & falls off at a sharp rate. We can infer certain properties of the time function from which it was derived.

For a random process (WSS) $x(t)$, we can define the autocorrelation function as,

$$R_x(\tau) = E[x(t)\,x(t+\tau)]$$

[WSS - Wide Sense stationary]

$$FT[R_x(\tau)] \longrightarrow PSD(f)$$



→ large changes in the signal occur slowly (low freq.) & that rapid changes in the signal (high freq.) must be of low amp. (PSD graph)

→ (Autocorr. graph) :- broad, slowly changing autocorr. func^n. suggests that there will only slight change on a sample-to-sample basis & that a time interval exceeding the corr. distance is reqd. for a full amplitude change.

→ corr. dist :- time difference b/w peak corr. & first zero corr. Corr. values for single sample delay ~ 0.79 to 0.87 &

corr. dist :- 4 to 6 samples.

T:- sampling interval. So, the difference b/w adjacent time samples for speech is small. Instead of Tx. the sample values, we Tx the diff b/w successive sample".

instead of $m[k]$, we Tx, $d[k] = m[k] - m[k-1]$

→ At the Rx, knowing $d[k]$ & several previous sample values $m[k-1]$, we can construct $m[k]$ iteratively at the Rx.

→ Diff. b/w successive samples is gen. much smaller than the sample values.

$m_p \downarrow$, $\Delta V = \frac{2m_p}{L} \downarrow$ → reduction in QN power.

$\because$ reduction in quantizⁿ noise power for a given L (or n)

↳ This means that for a given n (or Tx BW) we can ↑ the SQNR, or for a given SQNR, we can ↓ n (or Tx B.W.).