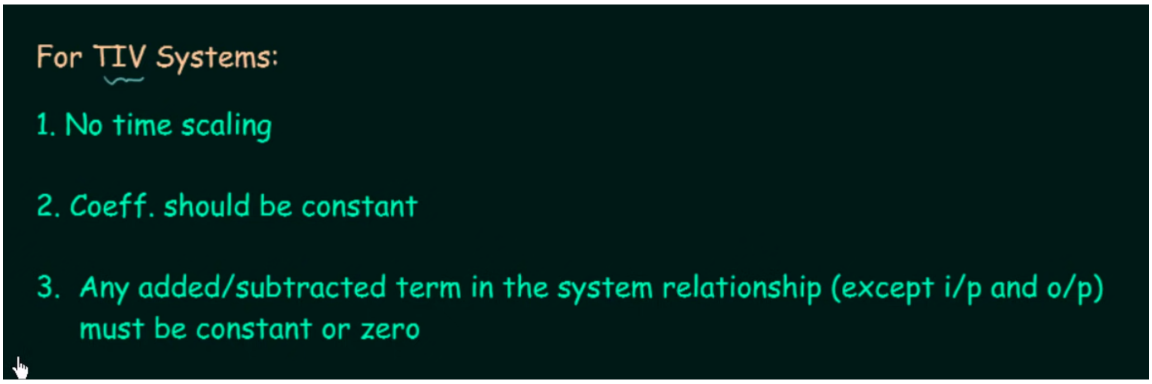
End Exam

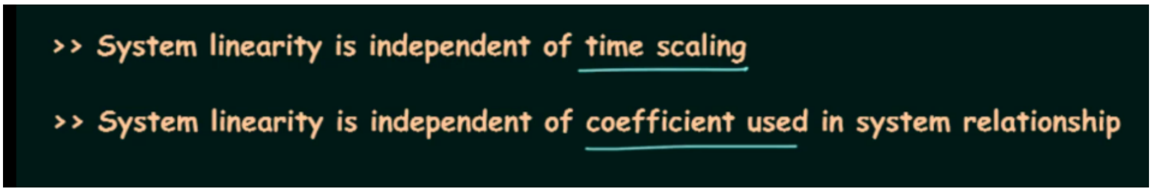
▼ TIV and TV



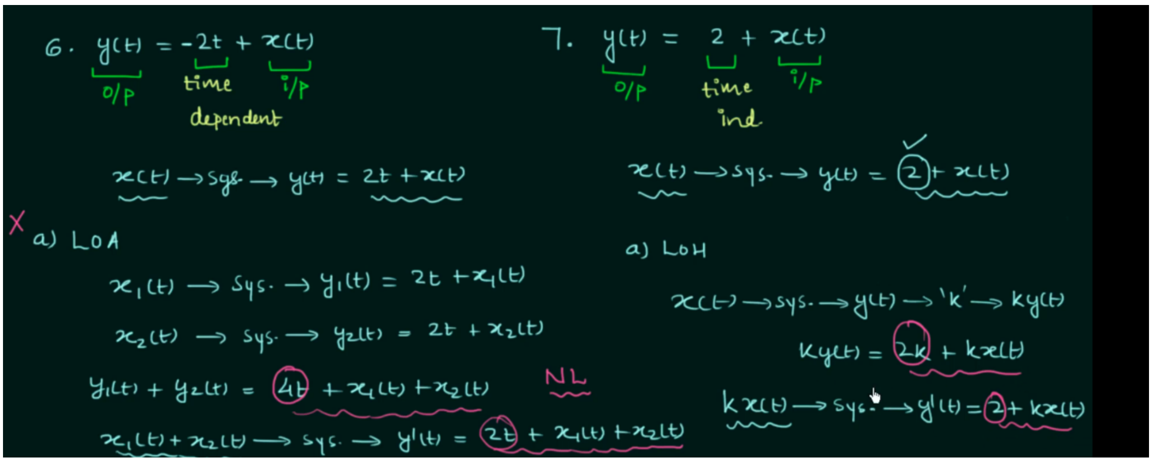
split systems are always Tv

▼ Linearity

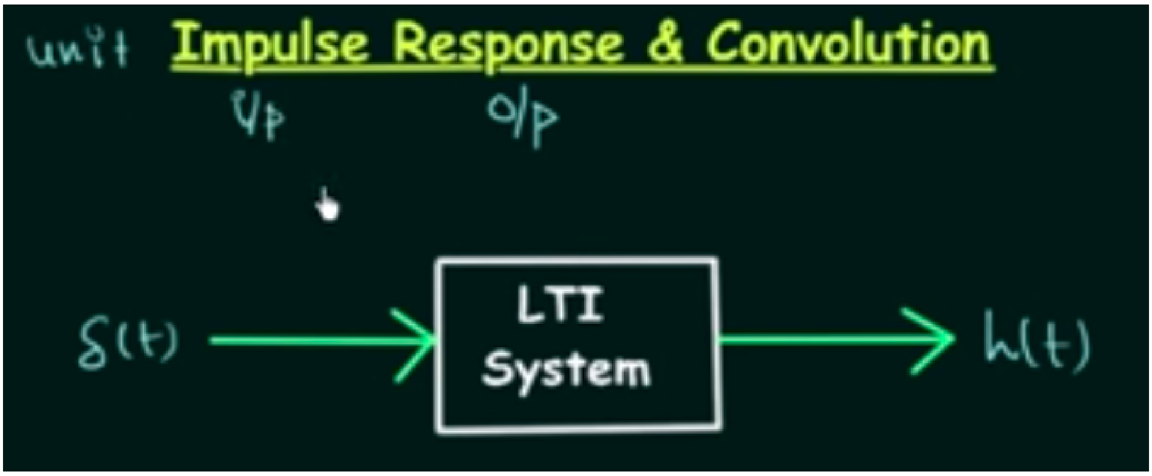
should follow LOA and LOH



but when there is y = x^n(t) then its not linear n>1

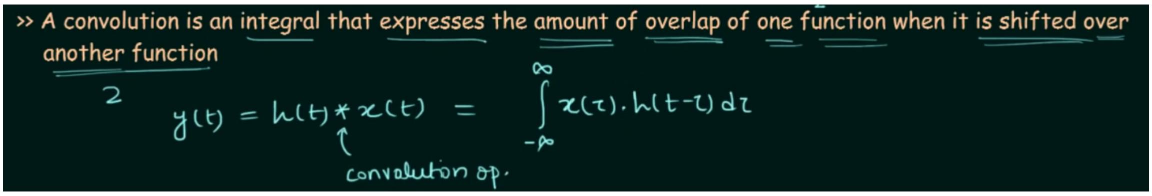


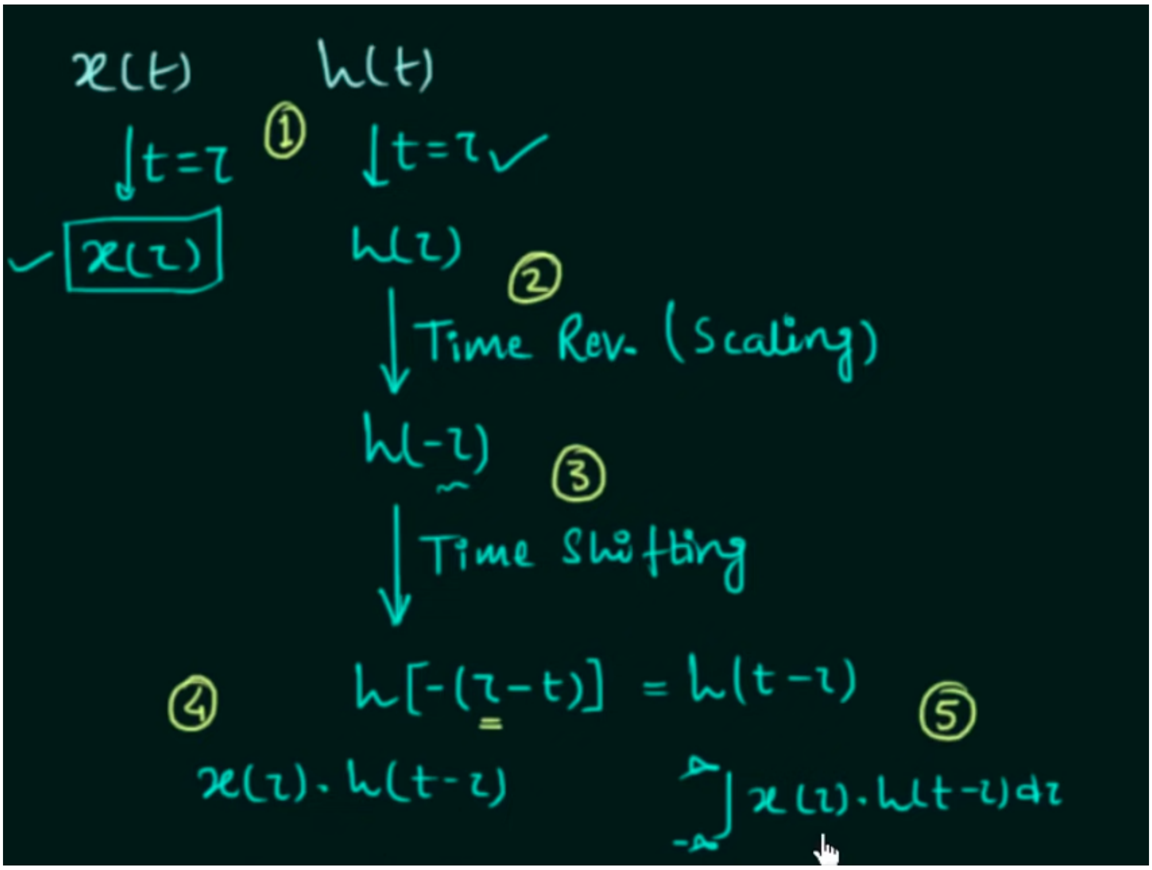
▼ Impulse response



when ever a unit impulse is supplied to an LTI system the response we get is called impulse response and it is fixed for an LTI system

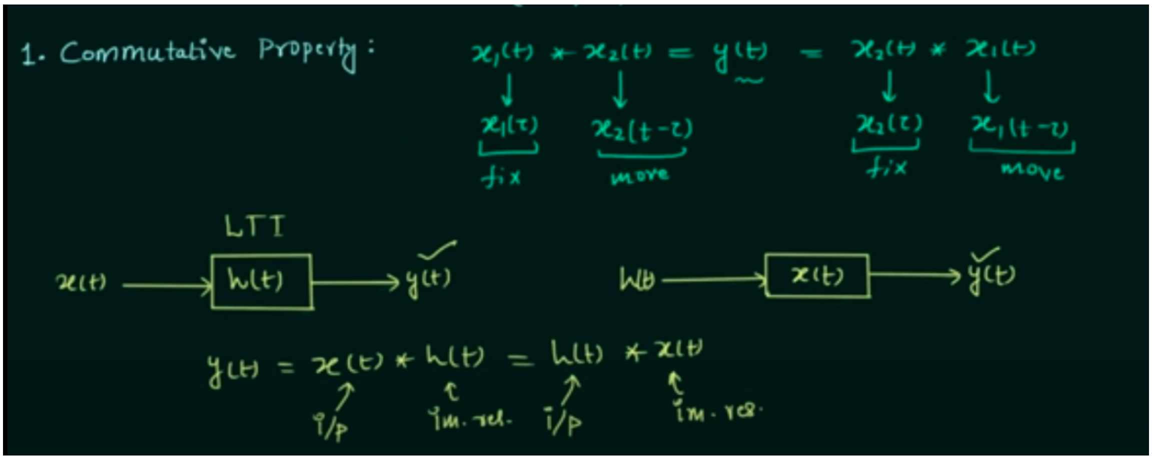
▼ Convolution



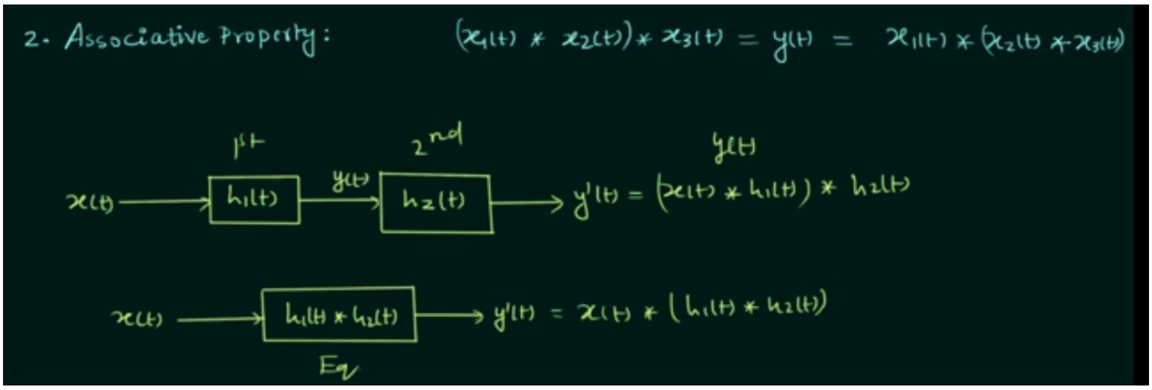


▼ Properties of Convolution [not done fully]

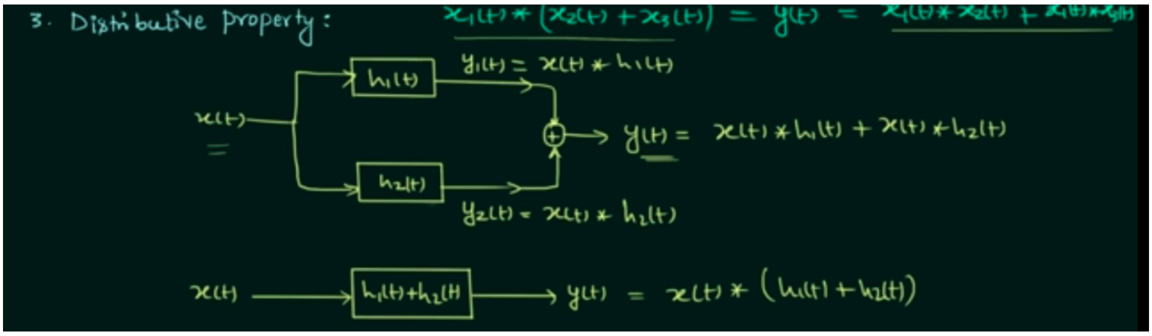
1. Communtative



2. Associative



3. Distributive

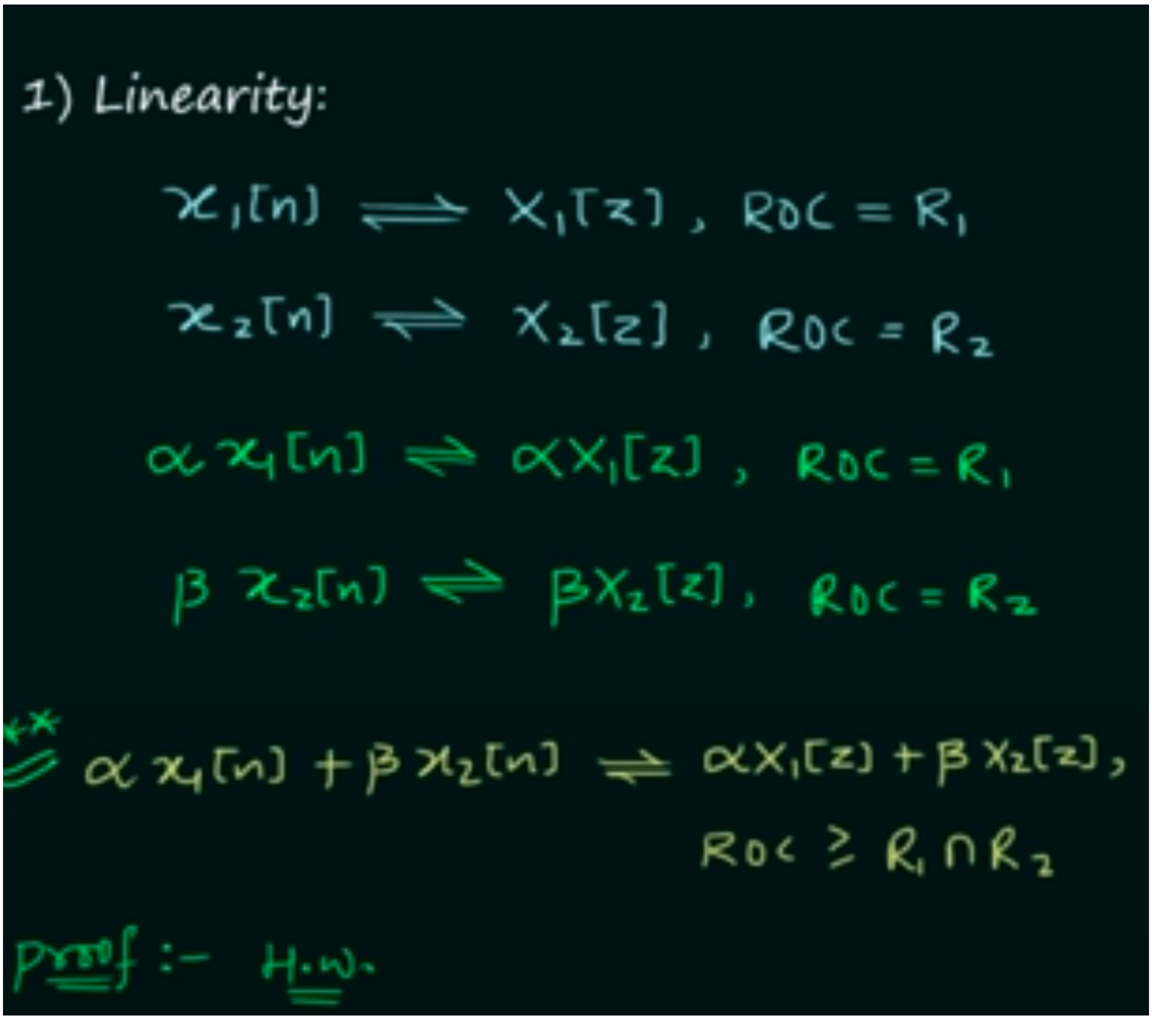


4.

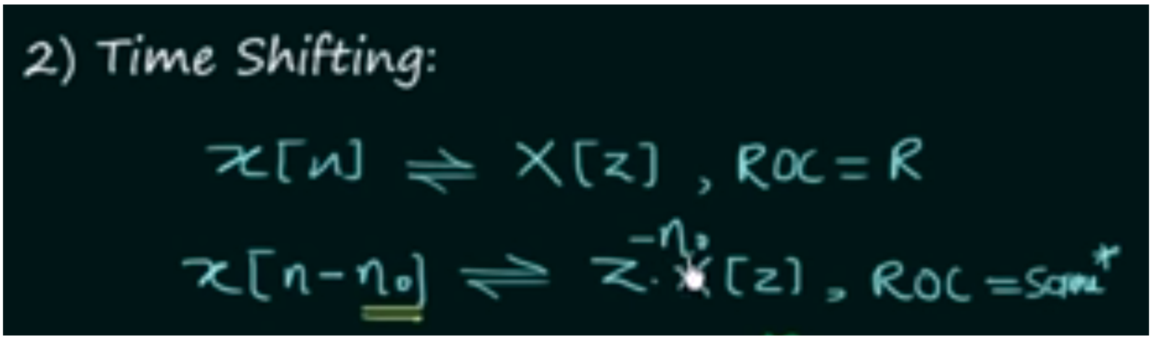
▼ Properties of Z transform

1. Linearity

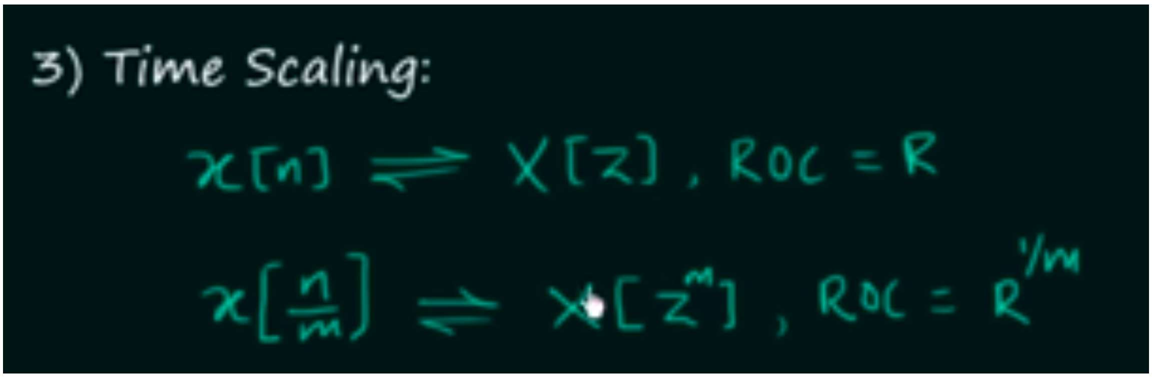
Correction: ROC is = intersection of all other ROCs



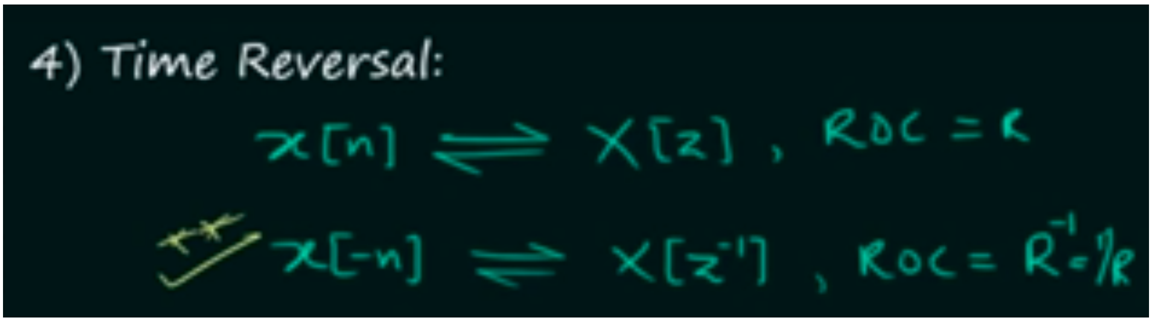
2. Time shifting



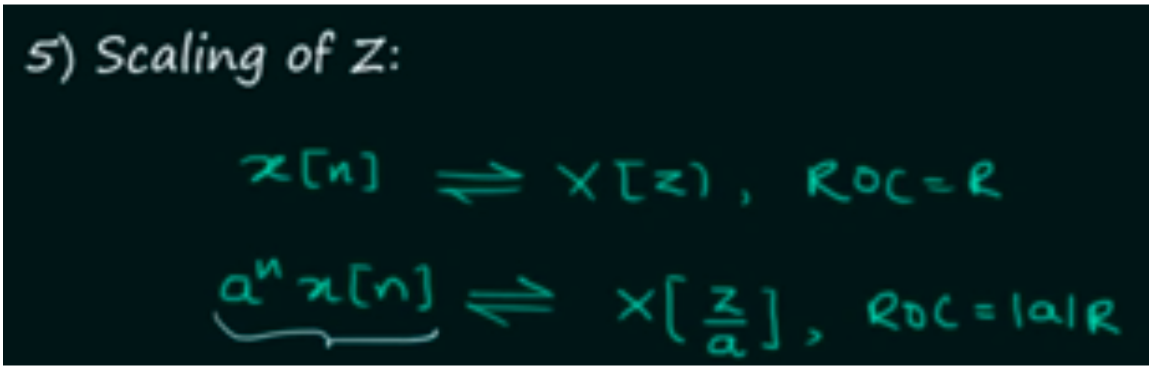
3. Time scaling



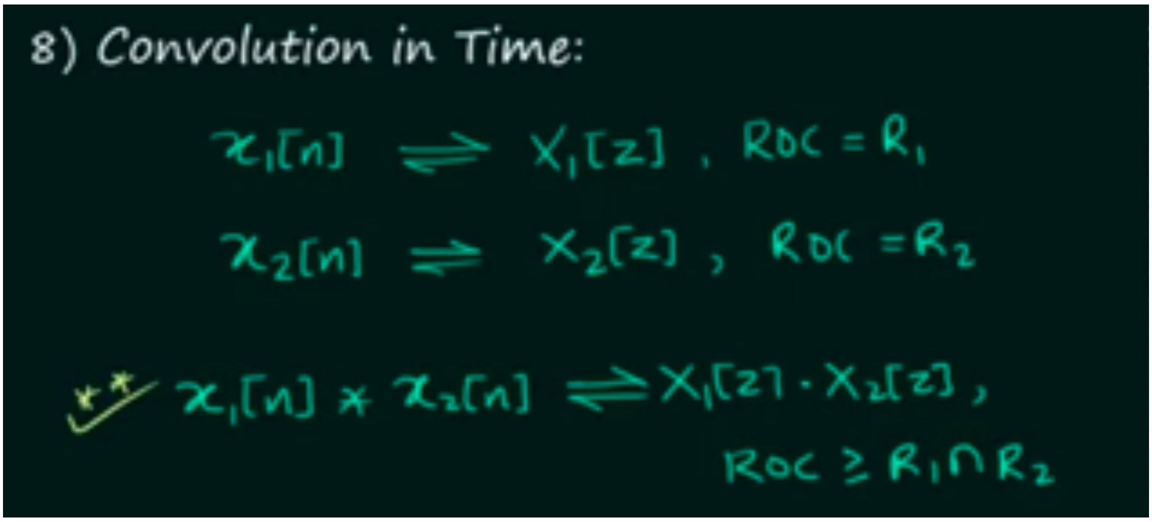
4. Time Reversal



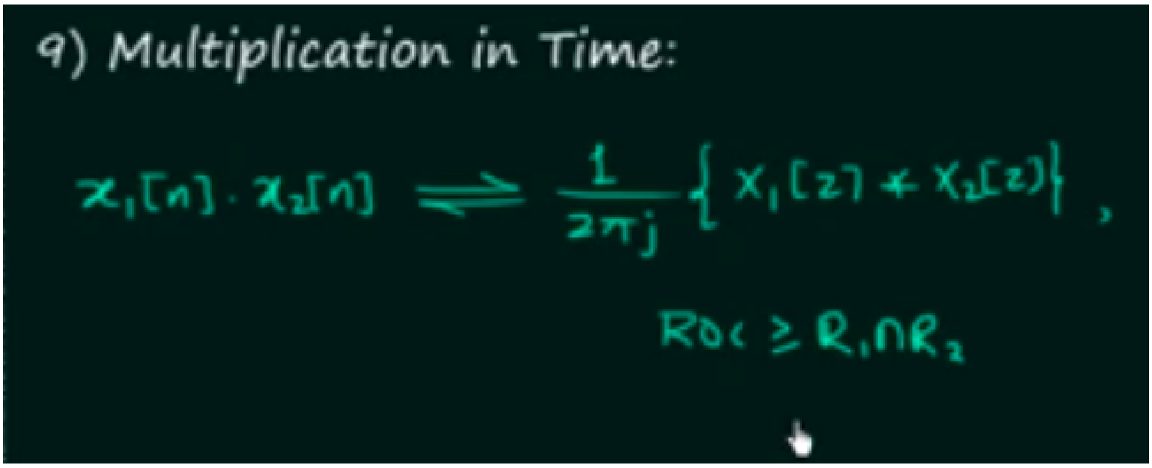
5. scaling of Z



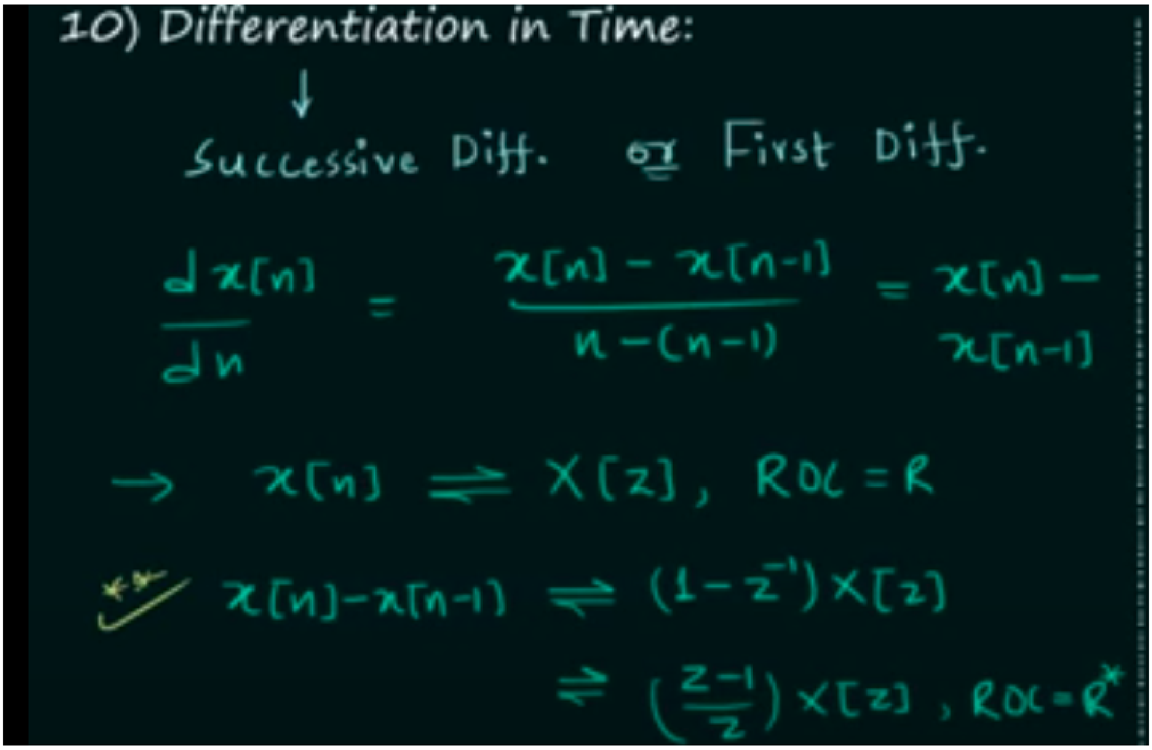
6. Convolution in Time is multiplication in Z



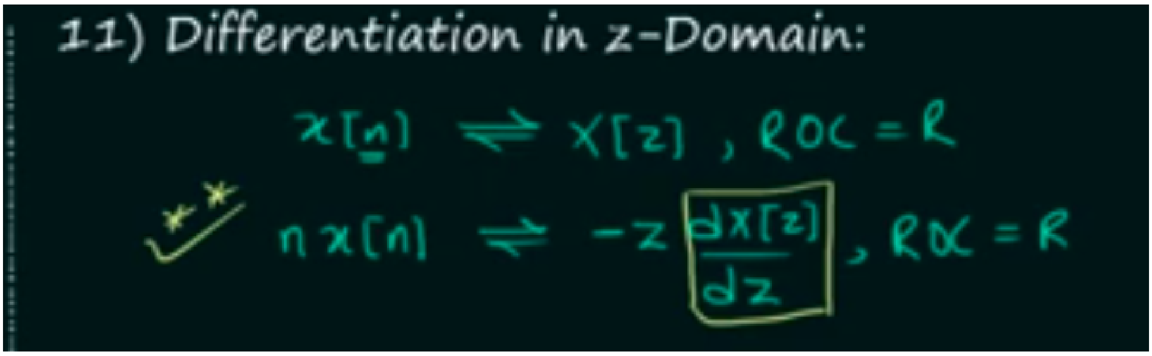
7. Multiplication in time is Convolution in Z



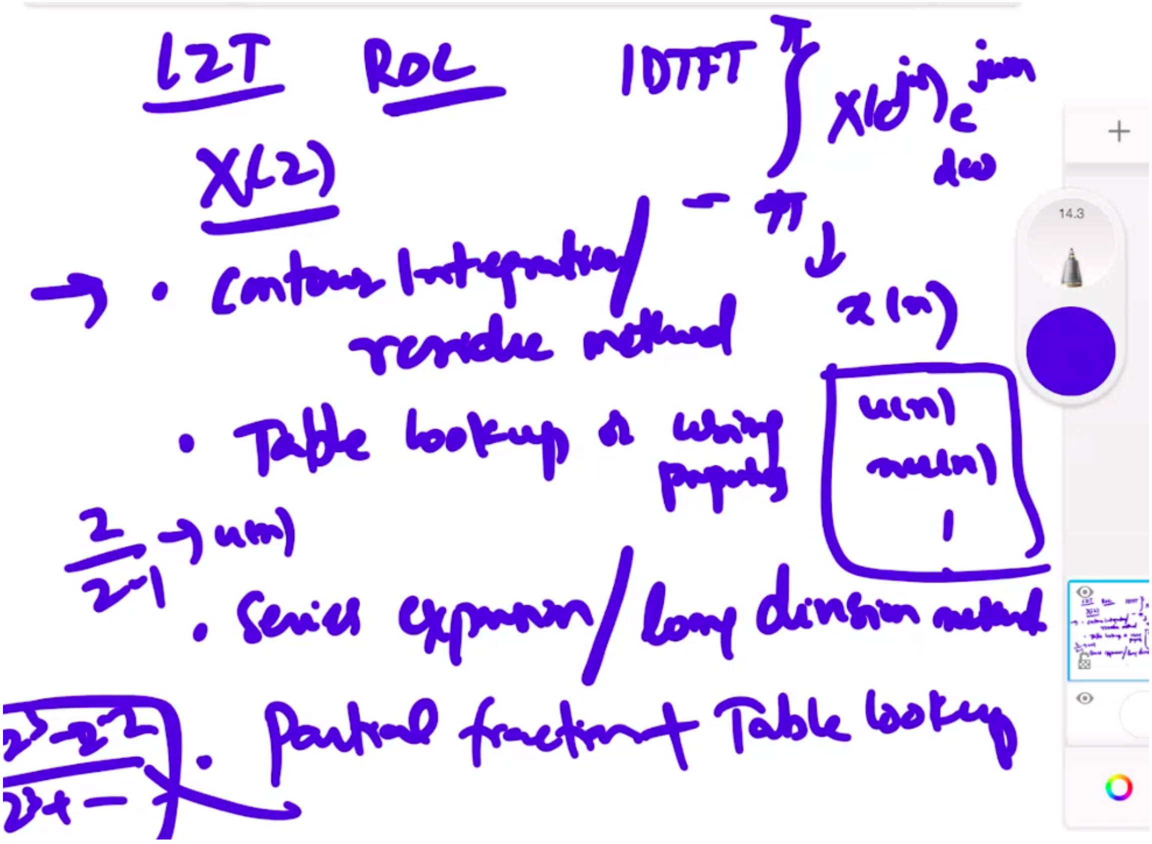
8. Diff in time



9. Diff in Z

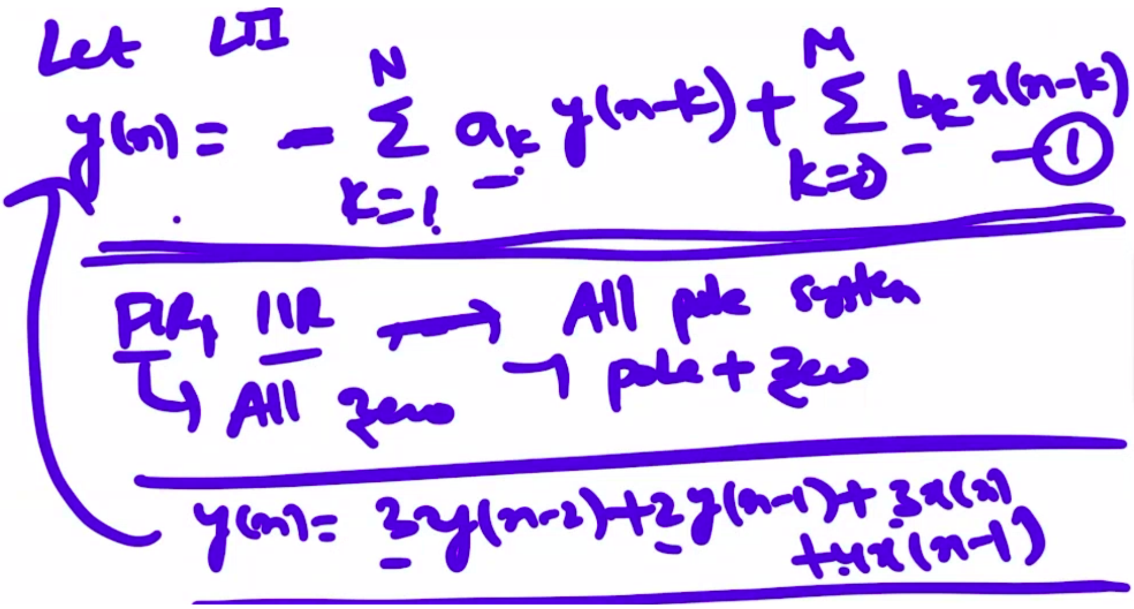


▼ IZT



1. Table look up method: dekh ke krlo
2. Partial fractions
3. long division
4. contour integration

▼ ZT, IZT in LTI, filter design



$$\frac{Y(z)}{X(z)} = \frac{\sum_{k=0}^{M} b_k z^{-k}}{1 + \sum_{k=1}^{N} a_k z^{-k}}$$

values at which H(z) = 0 → zeroes, H(z) → inf → poles

all zero system: output depends only on present and past inputs , i.e. ak=0

such systems are always stable as there are no poles

IIR [infinite impulse response] :

if bk=0, all pole system

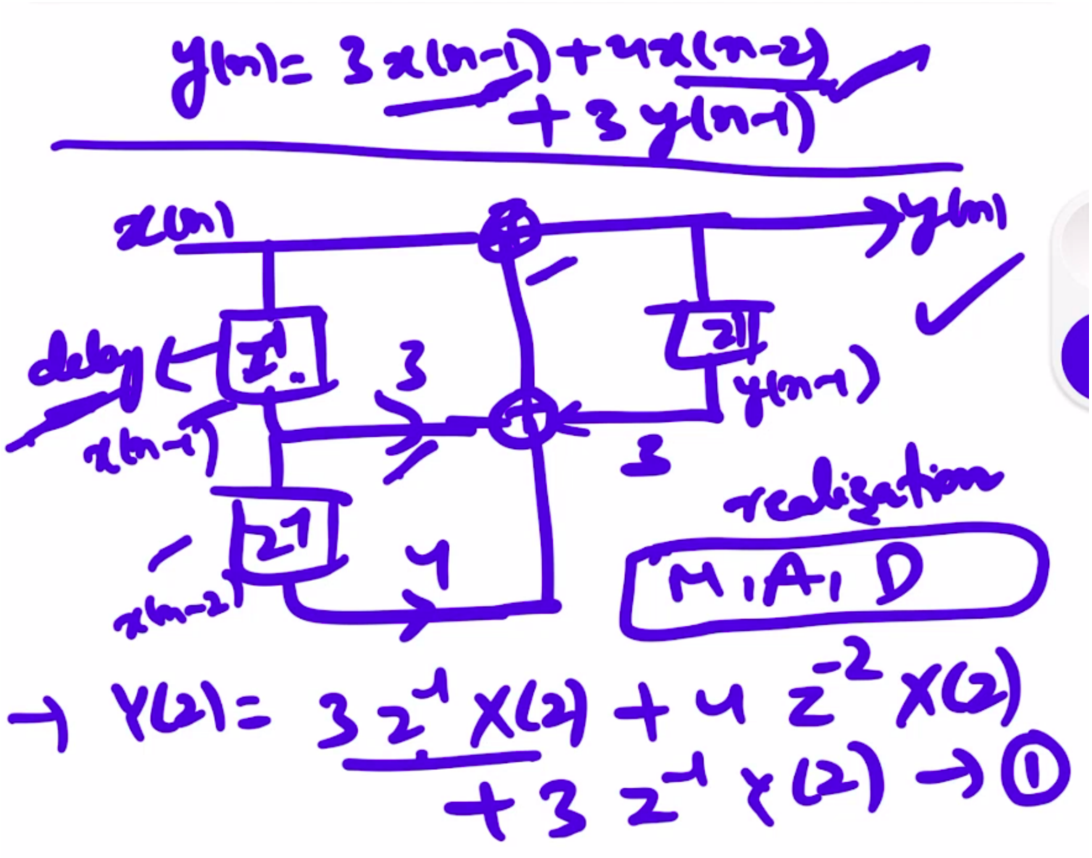
→ sometimes not stable hence

→ IIR can have both poles and zeroes

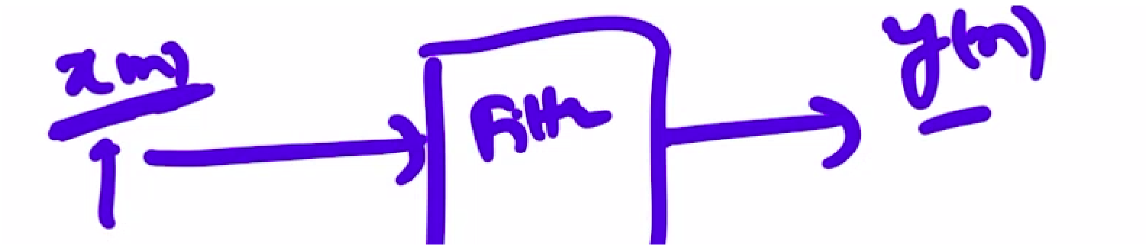
→ FIR will always have no poles

▼ Digital Filter

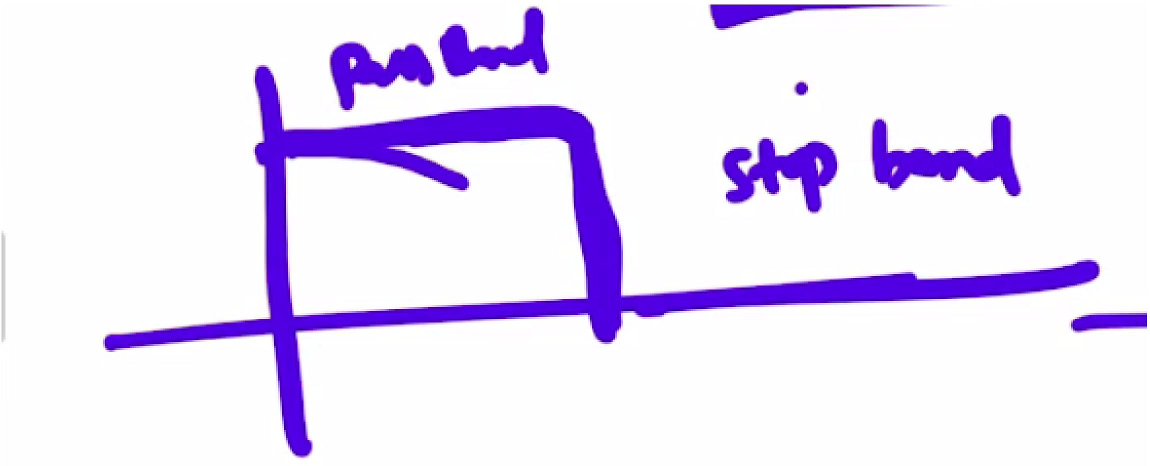
→ we need M, A, D to implement i.e ralise eqns like:



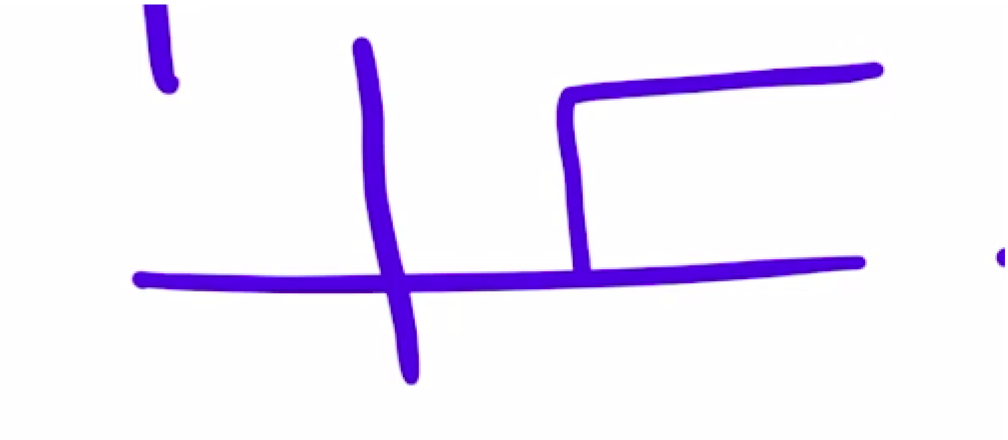
So we have been given some input signal and we want to suppress some unwanted frquenecies then we apply filter



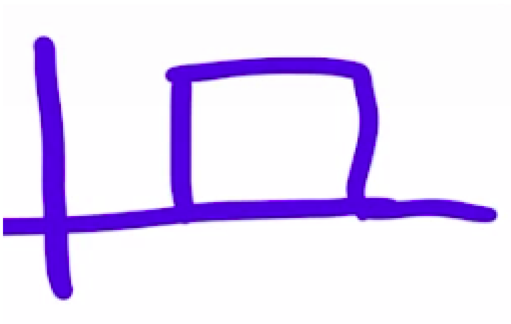
ex: low pass filter



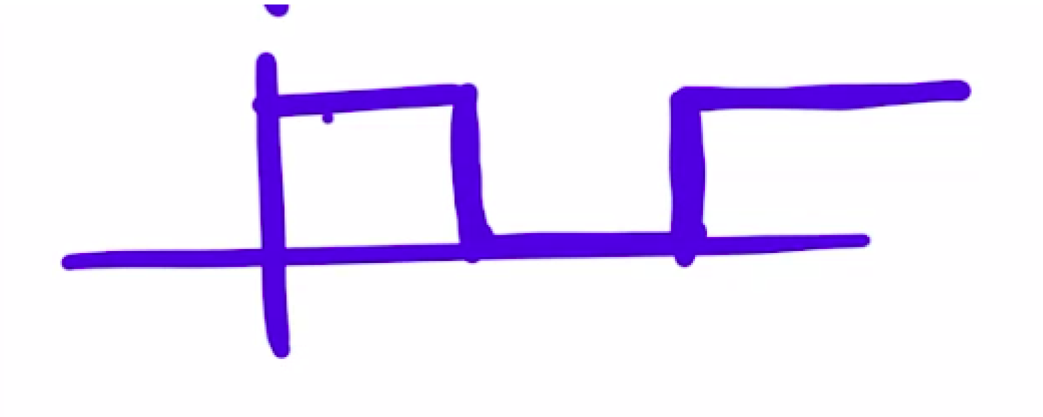
high pass filter



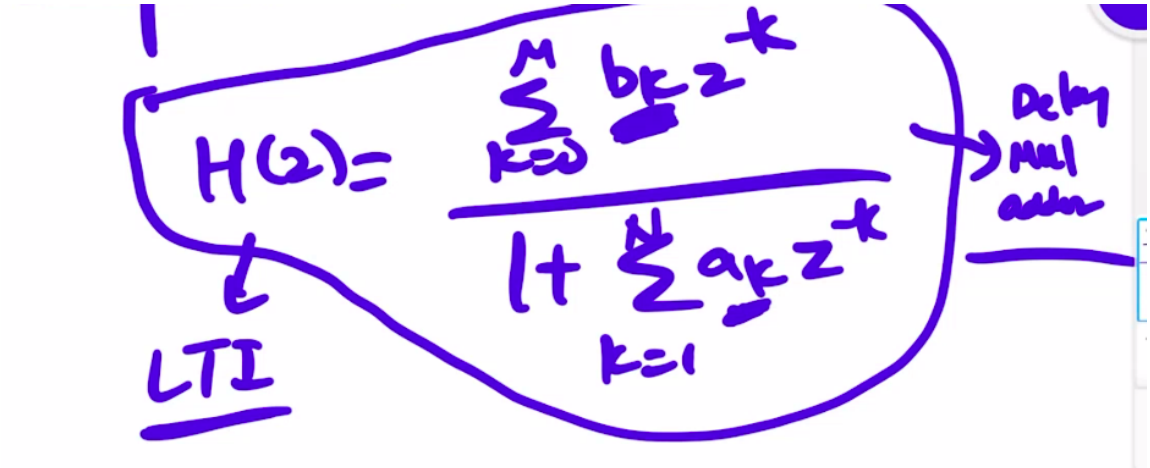
band pass



band rejection



so overall, all you need is come up with some ak and bk values and we get a filter



advantages:

no problem with temp or aging like with resistors

reconfiguration is easier

compact

realisation and flexibility

PROBLEM:

quantisation error can make some issues

FIR

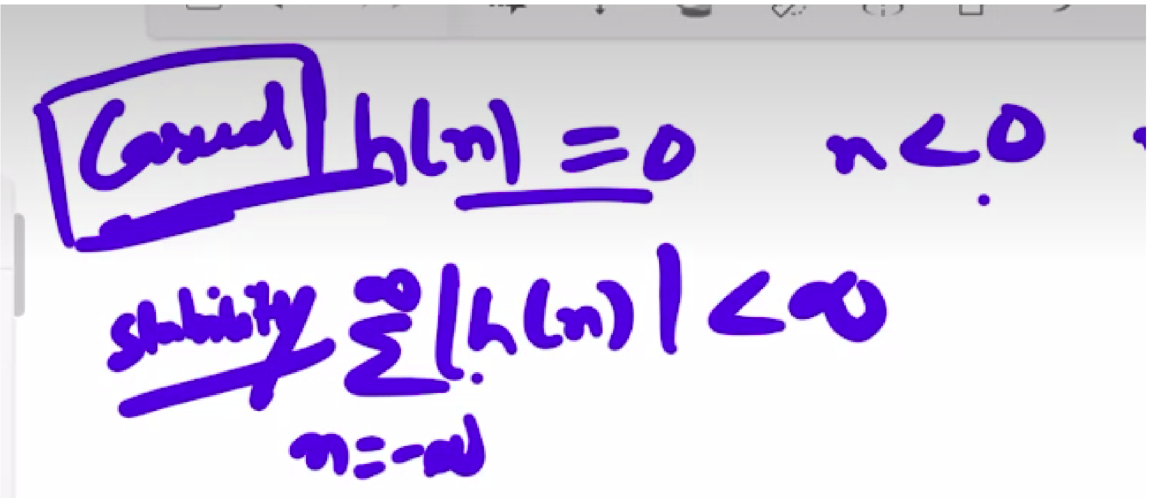
used for stable filters but need much more values for the coeff in numeratot and we can design that easily with less values of ak and bk also

with more bks u need more delay elements, hence number of delay elements more here

IIR

may or may not be stable but a=merits above

So the filter we are using should be LTI, stable, causal.



[right side signal]

$H(z) \rightarrow$ Stability

$$\sum_{n=-\infty}^{\infty} |h(n)| < \infty$$

$h(n)$

$$\underline{H(z)} = \sum_{n=-\infty}^{\infty} h(n) z^{-n}$$

$$\sum_{n=-\infty}^{\infty} h(n) < \infty \quad \boxed{z=1}$$

$\downarrow$ ROC

Should include unit circle.

H(Z) is stable if ROC also has unit circle in it.

i.e poles shud be inside unit circle for a stable IIR system