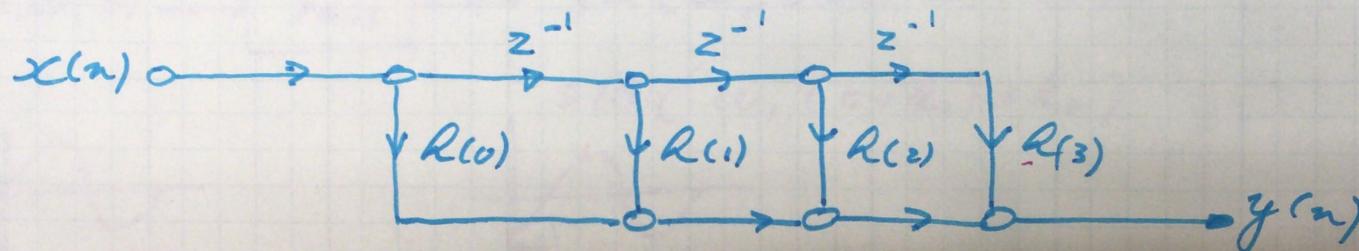
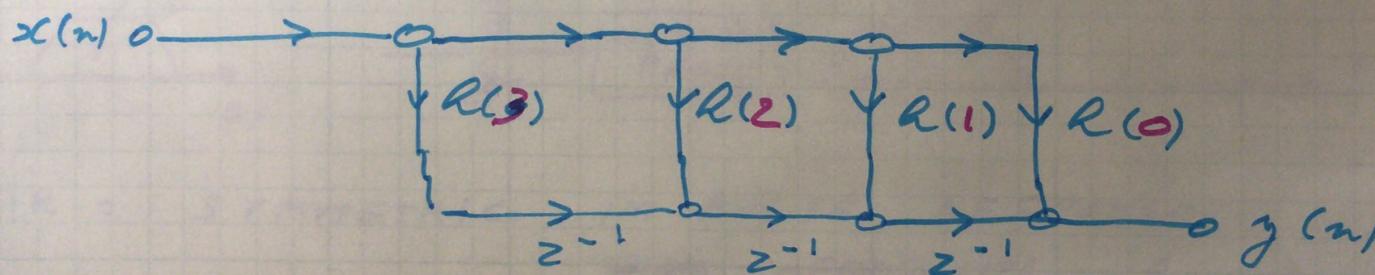


DIRECT - FORM FIR

$$H(z) = \sum_{n=0}^N h(n) \cdot z^{-n} = \frac{Y(z)}{X(z)}$$



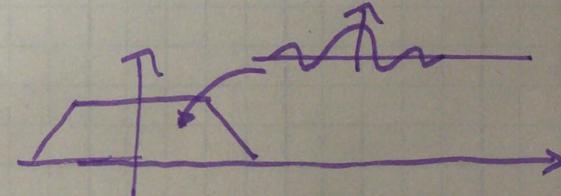
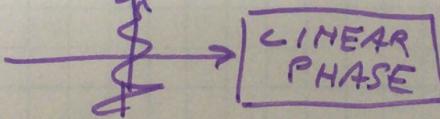
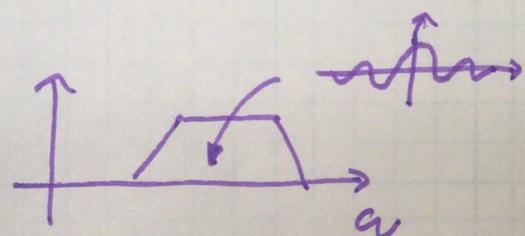
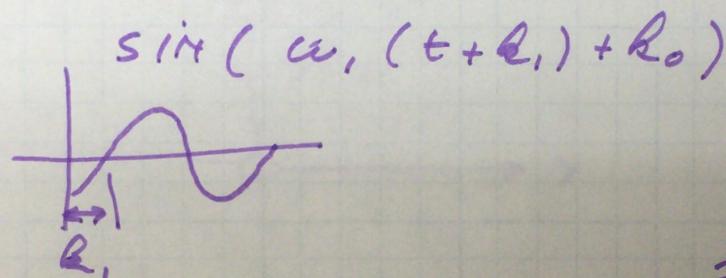
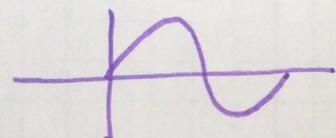
TRANSPOSE - FORM FIR



### LINER-PHASE FILTER

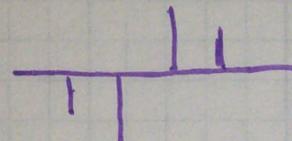
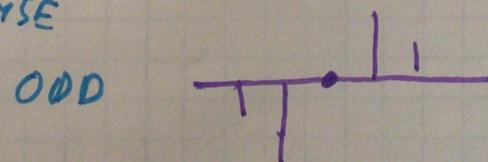
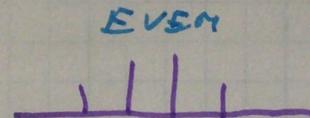
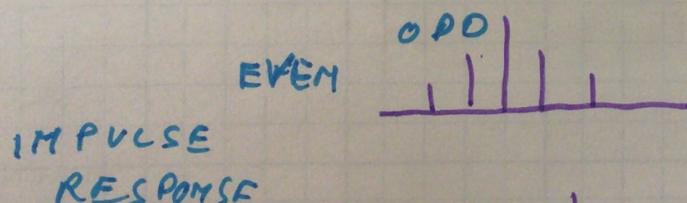
$$\phi(\omega) = k_1 \cdot \omega + k_0$$

$\sin(\omega, t) \rightarrow \boxed{\text{ALL PASS}} \rightarrow \sin(\omega, t + k_1 \omega, k_0)$

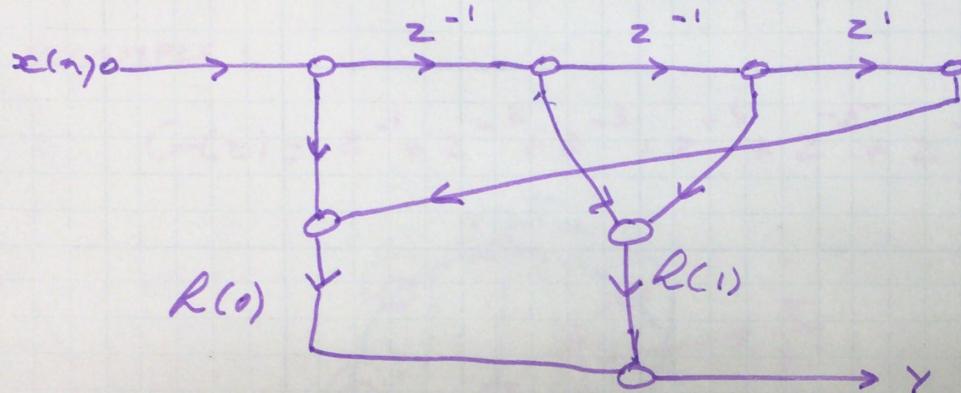


FIR = SYMMETRIC IN PULSE RESPONSE

TAPS COEFFICIENTS



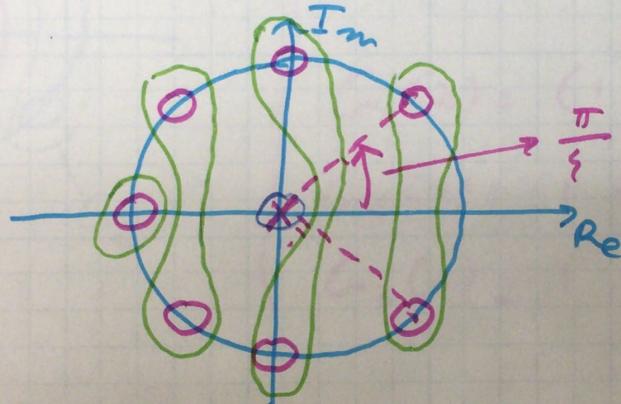
$$a.c + b.c = (a+b).c$$



## CASCADE FORM

EXAMPLE :

$$G(z) = z^{-1} + z^{-2} + z^{-3} + z^{-4} + z^{-5} + z^{-6} + z^{-7} + z^{-8} = \frac{N(z)}{D(z)} \cdot \frac{R(z^8)}{z^8}$$



SECOND ORDER STAGE:

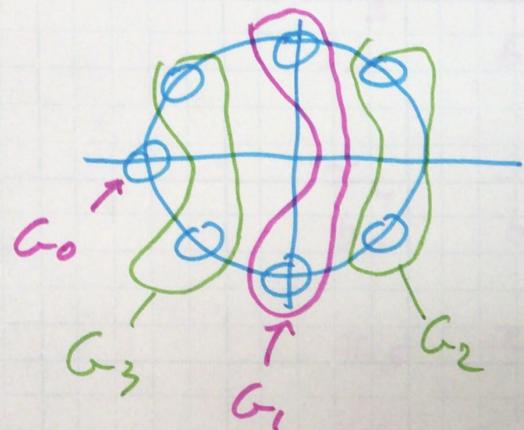
$$V(z) = (1 + A \cdot e^{j\phi} \cdot z^{-1}) \cdot (1 + A \cdot e^{-j\phi} \cdot z^{-1})$$

$$V(z) = 1 + 2A \cos \phi \cdot z^{-1} + A^2 z^{-2}$$

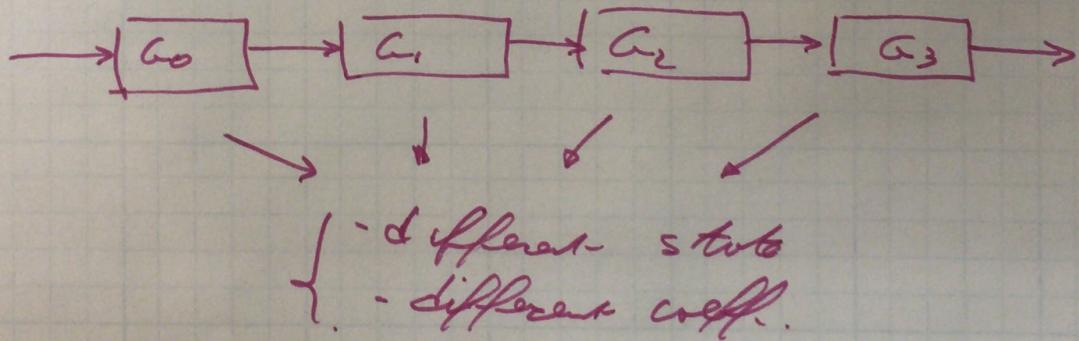
$$= \frac{z + A \cdot e^{-j\phi}}{z + 1} = 0? \quad z = -A \cdot e^{-j\phi}$$



$$G(z) = G_0(z) \cdot G_1(z) \cdot G_2(z) \cdot G_3(z)$$



$$\left\{ \begin{array}{l} G_0(z) = 1 + z^{-1} \\ G_1(z) = (1 + z^{-2}) = (1 + e^{\frac{j\pi}{2} \cdot z^{-1}})(1 + e^{-j\frac{\pi}{2} \cdot z^{-1}}) \\ G_2(z) = 1 + \sqrt{2} \cdot z^{-1} + z^{-2} \\ G_3(z) = 1 - \sqrt{2} \cdot z^{-1} + z^{-2} \end{array} \right.$$



CASCADE FILTER IN C.

LONG FILTERS IN C

$$\begin{matrix} x_3 & x_2 & x_1 & x_0 & \rightarrow \\ b_0 & b_1 & b_2 & b_3 \end{matrix}$$

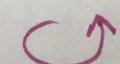
$$\begin{matrix} x_4 & x_3 & x_2 & x_1 & \rightarrow \\ b_0 & b_1 & b_2 & b_3 \end{matrix}$$

$$\begin{matrix} x_5 & x_4 & x_3 & x_2 & \rightarrow \\ b_0 & b_1 & b_2 & b_3 \end{matrix}$$

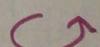
## CIRCULAR BUFFER

$x_3$	$x_2$	$x_1$	$x_0$
$b_0$	$b_1$	$b_2$	$b_3$

$x_3$	$x_2$	$x_1$	$x_0$
$b_1$	$b_2$	$b_3$	$b_0$



$x_3$	$x_2$	$x_5$	$x_4$
$b_2$	$b_3$	$b_0$	$b_1$



$x_3$	$x_6$	$x_5$	$x_4$
$b_3$	$b_0$	$b_1$	$b_2$

