

Ex 3 Calcolare la risposta in frequenza del sys caratterizzato dalla rel input-output:

$$y(n) = x(n) - \frac{1}{2}x(n-1) + 2x(n-2)$$

Q1: La risposta in frequenza è $H(v)$ ed è calcolata trasformando $h(t) \Rightarrow H(v)$

$$\Rightarrow h(t) = \delta(n) - \frac{1}{2}\delta(n-1) + 2\delta(n-2) \iff 1 - \frac{1}{2}e^{-j2\pi v} + 2e^{-j4\pi f} = H(v)$$

Q2: Dato $x(n) = \delta(n+1) - \delta(n-1)$ calcolare $\mathcal{Z}_{yx} \iff S_{yx}$

$$y(n) \Big|_{x(n)} = \delta(n+1) - \delta(n-1) - \frac{1}{2} \left[\delta(n+1-1) - \delta(n-1-1) \right] + 2 \left[\delta(n+1-2) - \delta(n-1-2) \right]$$

$$= \delta(n+1) - \delta(n-1) - \frac{1}{2} \delta(n) + \frac{1}{2} \delta(n-2) + 2\delta(n-1) - 2\delta(n-3)$$

$$= \delta(n+1) - \frac{1}{2}\delta(n) + \delta(n-1) + \frac{1}{2}\delta(n-2) - 2\delta(n-3) = \left[\overset{-1}{1}, \overset{0}{-\frac{1}{2}}, \overset{1}{1}, \overset{2}{1}, \overset{3}{-2} \right]$$

$$x(n) = \left[\overset{-1}{1}, \overset{0}{0}, \overset{1}{-1}, \overset{2}{0}, \overset{3}{0} \right]$$

\Rightarrow		$1 \quad -\frac{1}{2} \quad 1 \quad 1 \quad -2$	
$\mathcal{Z}(t+4)$	$1 \quad 0 \quad -1 \quad 0 \quad 0$		$\mathcal{Z}(-4) = 0$
$\mathcal{Z}(t+3)$	$1 \quad 0 \quad -1 \quad 0 \quad 0$		$\mathcal{Z}(-3) = 0$
$\mathcal{Z}(t+2)$	$1 \quad 0 \quad -1 \quad 0 \quad 0$		$\mathcal{Z}(-2) = -1$
$\mathcal{Z}(t+1)$	$1 \quad 0 \quad -1 \quad 0 \quad 0$		$\mathcal{Z}(-1) = \frac{1}{2}$
$\mathcal{Z}(t)$	$1 \quad 0 \quad -1 \quad 0 \quad 0$		$\mathcal{Z}(0) = 1 - 1 = 0$
$\mathcal{Z}(t-1)$	$1 \quad 0 \quad -1 \quad 0 \quad 0$		$\mathcal{Z}(1) = -\frac{1}{2} - 1 = -\frac{3}{2}$
$\mathcal{Z}(t-2)$	$1 \quad 0 \quad -1 \quad 0 \quad 0$		$\mathcal{Z}(2) = 1 + 2 = 3$
$\mathcal{Z}(t-3)$	$1 \quad 0 \quad -1 \quad 0 \quad 0$		$\mathcal{Z}(3) = 1$
$\mathcal{Z}(t-4)$	$1 \quad 0 \quad -1 \quad 0 \quad 0$		$\mathcal{Z}(4) = -2$

$$\Rightarrow \mathcal{Z}_{yx} = \left[0, 0, -1, 0, \frac{3}{2}, 3, 1, 2 \right]$$