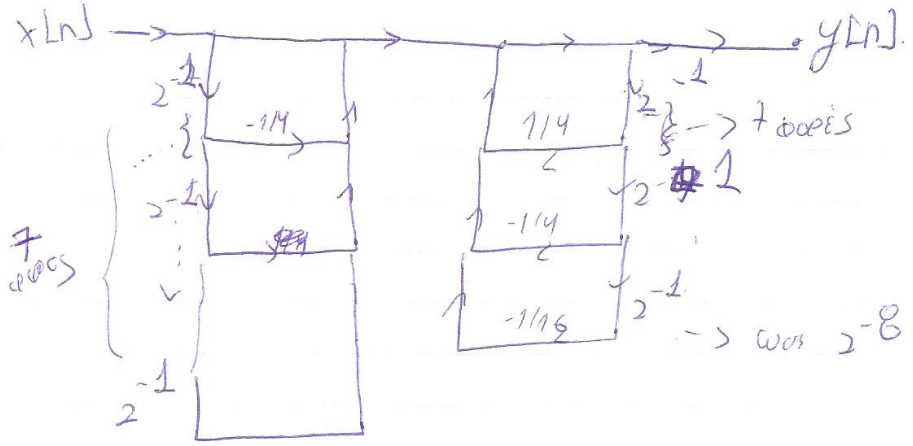
Σοφία Καλπάκη 3221
114-370 4η σειρά ασκήσεων

## 2η άσκηση

$$h[n] = \left(\frac{1}{4}\right)^n (u[n] - u[n-7]) = \left(\frac{1}{4}\right)^n u[n] - \left(\frac{1}{4}\right)^n u[n-7]$$

$$= \frac{1}{1-\frac{1}{4}z^{-1}} - \frac{1}{1+\frac{1}{4}z^{-7}} = \frac{1+\frac{1}{4}z^{-7} - 1 + \frac{1}{4}z^{-1}}{(1-\frac{1}{4}z^{-1})(1+\frac{1}{4}z^{-7})}$$

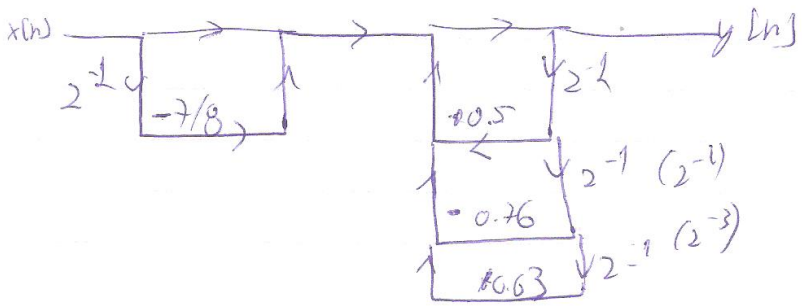
$$= \frac{\frac{1}{4}z^{-7} - \frac{1}{4}z^{-1}}{(1-\frac{1}{4}z^{-1})(1+\frac{1}{4}z^{-7})} = \frac{\frac{1}{4}(z^{-7} - z^{-1})}{1+\frac{1}{4}z^{-7} - \frac{1}{4}z^{-1} - \frac{1}{16}z^{-8}}$$



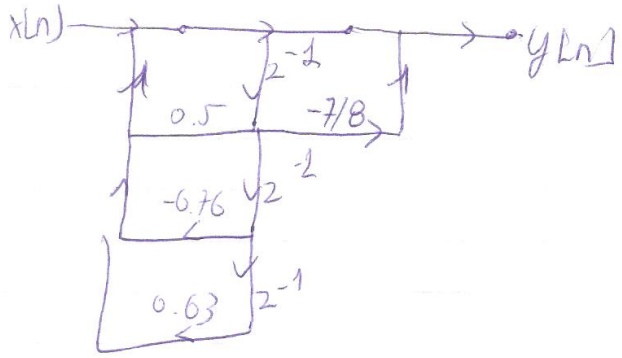

## 3η άσκηση

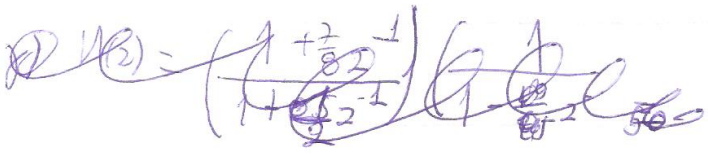
$$H(z) = \frac{1 + \frac{7}{8}z^{-1}}{1 - 0.5z^{-1} + 0.76z^{-2} - 0.63z^{-3}}$$

α) DF1

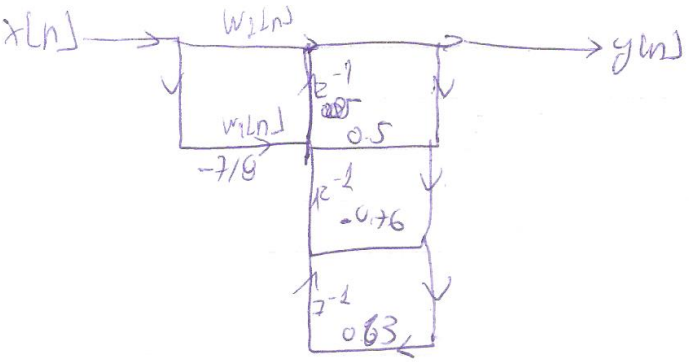


β) DFII



δ)




Άσκηση 5

Βάζοντας w1 w2 w3 w4 στους κόμβους (συμβολικά)

και έχουμε

$w_1^{(n)} = x[n] - \frac{1}{4} w_3[n-1]$

$w_2^{(n)} = w_1 + \frac{2}{5} w_2[n-1]$

$w_3^{(n)} = w_2[n-1] - \frac{2}{5} w_2[n]$

$w_4^{(n)} = \frac{1}{4} w_1[n] + w_3[n-1]$ → το w4 είναι το y[n]

$\hookrightarrow x[n] = w_1[n] + \frac{1}{4} w_3[n-1]$ ①

Από ① $\Rightarrow H(z) = \frac{\frac{1}{4} w_1[n] + w_3[n-1]}{w_1[n] + \frac{1}{4} w_3[n-1]}$

που δίνει $H(z) = \frac{\frac{1}{4} - \frac{1}{2} z^{-1} + z^{-2}}{1 - \frac{1}{2} z^{-1} + \frac{1}{4} z^{-2}}$

Άσκηση 1

α) $H(e^{j\omega}) = (e^{-j3\omega})(1+\cos(\omega)+\frac{2}{5}\cos(2\omega)-\frac{1}{5}\cos(3\omega))$

$= \frac{1}{5}e^{-j\omega} + \frac{1}{2}e^{-2j\omega} + e^{-3j\omega} + \frac{1}{2}e^{-4j\omega} + \frac{1}{10}e^{-6j\omega} + \frac{1}{5}e^{-5j\omega} - \frac{1}{10}$

$H(z) = \frac{1}{5}z^{-1} + \frac{1}{2}z^{-2} + z^{-3} + \frac{1}{2}z^{-4} + \frac{1}{5}z^{-5} + \frac{1}{10}z^{-6} - \frac{1}{10}$

είναι FIR διότι

απλά σε πεπερ $\sum_{k=0}^{N} b_k z^{-k}$

β) $h(z) = -\frac{1}{10}\delta[n] + \frac{1}{5}\delta[n-1] + \frac{1}{2}\delta[n-2] + \frac{1}{2}\delta[n-4] + \frac{1}{5}\delta[n-5]$