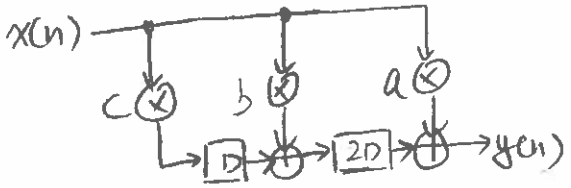
HW1 Solution

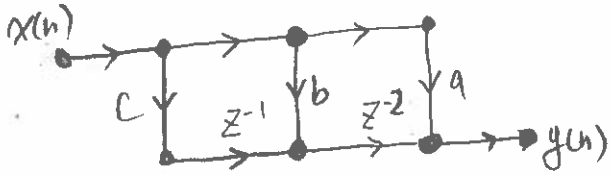
1) $y(n) = ax(n) + bx(n-2) + cx(n-3)$

a)



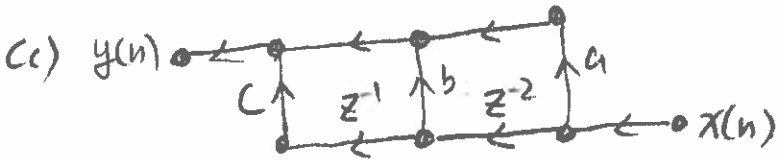
Critical path: 1 mult 1 added

b)

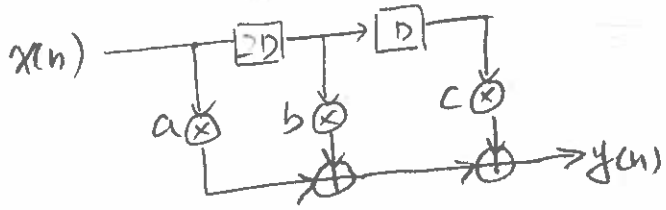


transpose

c)

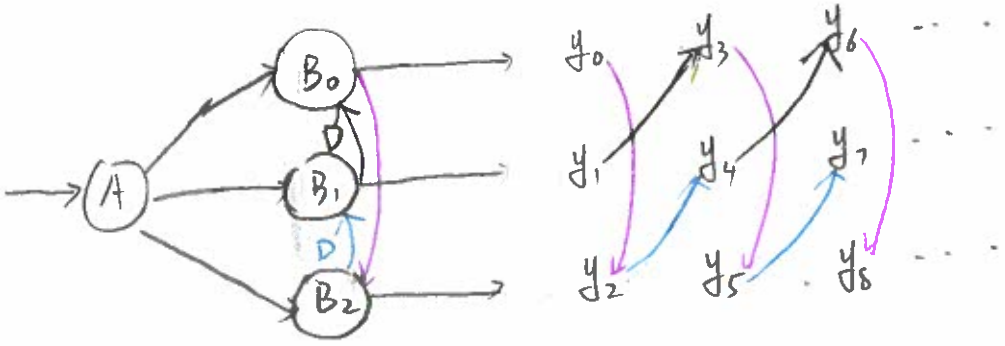


rotate 180°

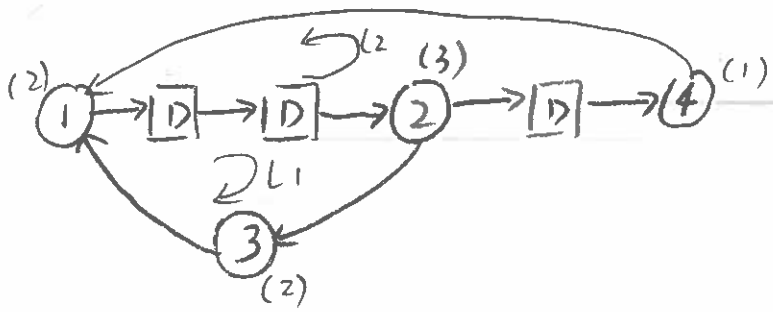


Critical path: 1 mult. 2 added.

2)

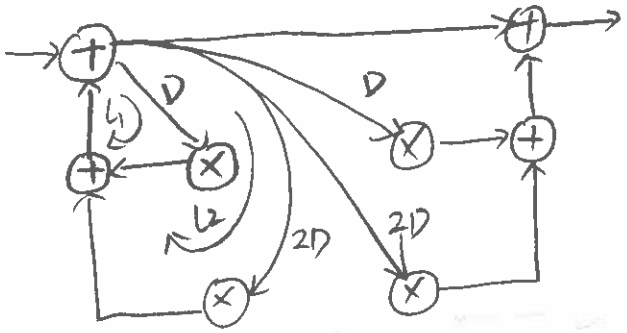


3)



$T_{L_1} = \frac{7}{2}$ $T_{L_2} = \frac{6}{3} = 2$ $T_\infty = \max\{T_{L_1}, T_{L_2}\} = \frac{7}{2}$

4)

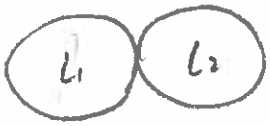


⊗ 2 u.t

⊕ 1 u.t

$T_{L_1} = \frac{4}{1} = 4$ $T_{L_2} = \frac{4}{2} = 2$ $T_\infty = \max\{T_{L_1}, T_{L_2}\} = 4$

5)



$T_\infty = \max\left\{\frac{P_1}{D_1}, \frac{P_2}{D_2}\right\}$

without loss of generality assume $\frac{P_1}{D_1} \geq \frac{P_2}{D_2} \Rightarrow P_1 D_2 \geq P_2 D_1$

loop bound of compound loop $= \frac{P_1 + P_2}{D_1 + D_2}$

$$\frac{P_1+P_2}{D_1+D_2} - \frac{P_1}{D_1} = \frac{P_1 D_1 + P_2 D_1 - P_1 D_1 - P_1 D_2}{(D_1+D_2) D_1} = \frac{P_2 D_1 - P_1 D_2}{(D_1+D_2) D_1} \leq 0$$

Hence $\frac{P_1+P_2}{D_1+D_2} \leq T_\infty$