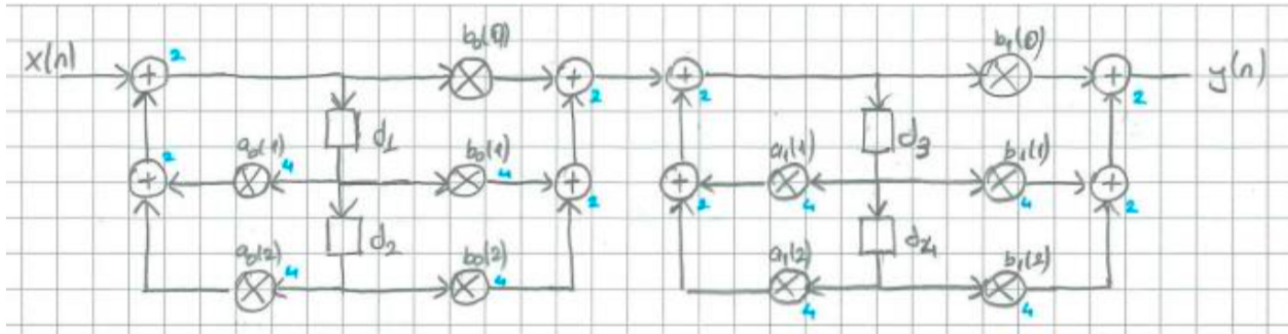
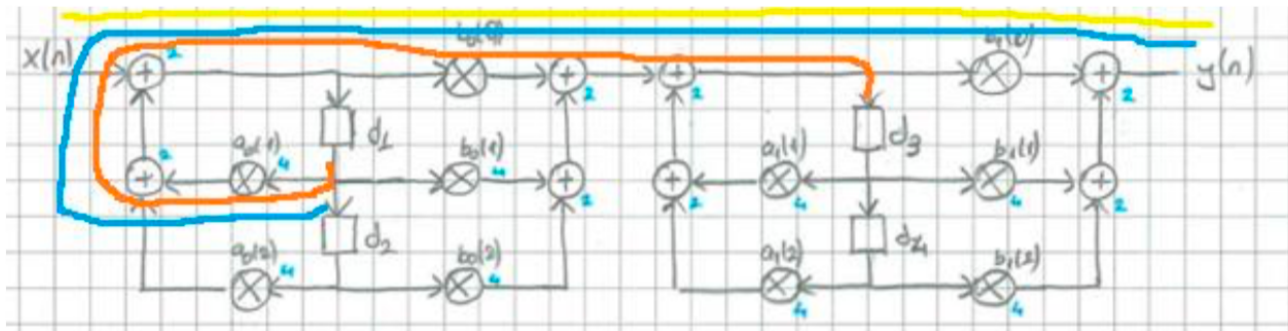


Draw a DFG for 4th order IIR digital filter;



Critical path is;



- Input to output path $T_{critical} = 4 * TA + 2 * TM = 16$

- State to state path $T_{critical} = 4 * TA + 2 * TM = 16$

- State to output path $T_{critical} = 5 * TA + 3 * TM = 22$

The critical path is 22 ut.

Iteration bound is founded from LPM algorithm;

$L(:, :, 1) =$

8 0 16 -1

8 -1 16 -1

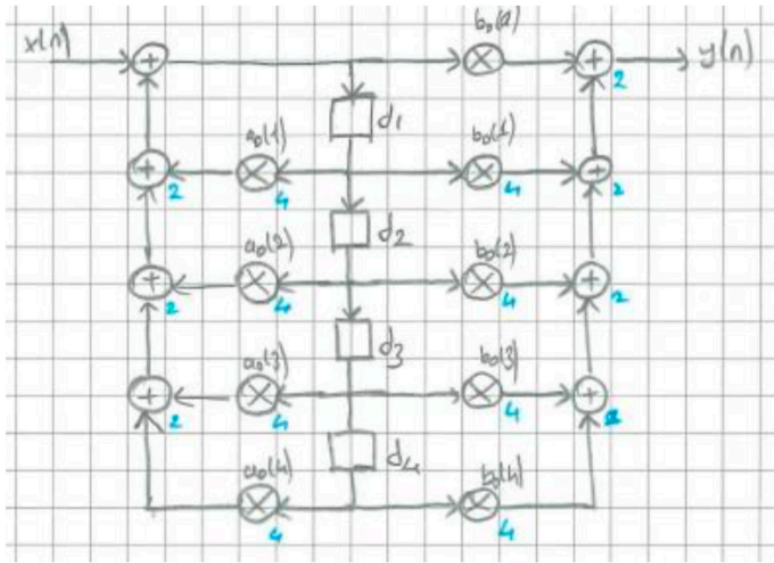
-1 -1 8 0

-1 -1 8 -1

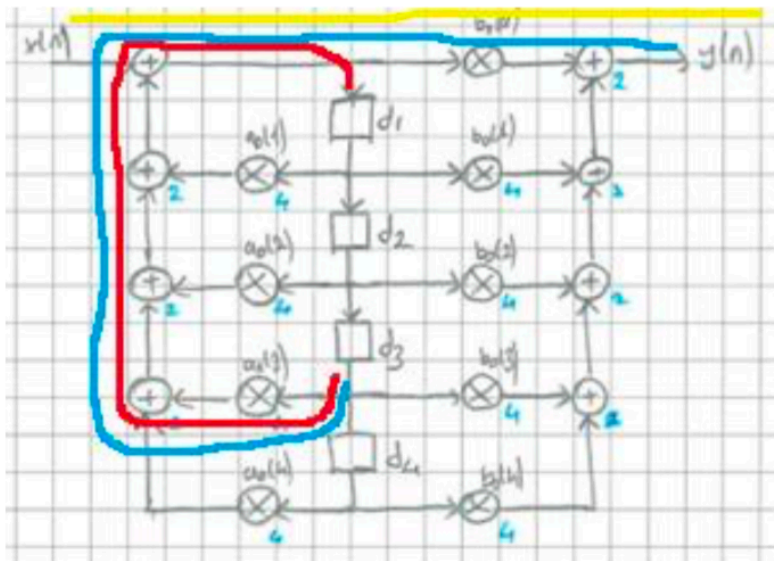
LPM \longrightarrow 8 u.t.

- 2. Repeat the previous question for a direct form 4th-order IIR filter.

Draw a DFG for 4th order IIR digital filter;



Critical path is;



- Input to output path $T_{\text{critical}} = 2 * TA + TM = 8$
- State to state path $T_{\text{critical}} = 4 * TA + TM = 12$
- State to output path $T_{\text{critical}} = 5 * TA + 2 * TM = 18$

The critical path is 18 ut.

Iteration bound is founded from LPM algorithm

$L(:, :, 1) =$

8 0 -1 -1

10 -1 0 -1

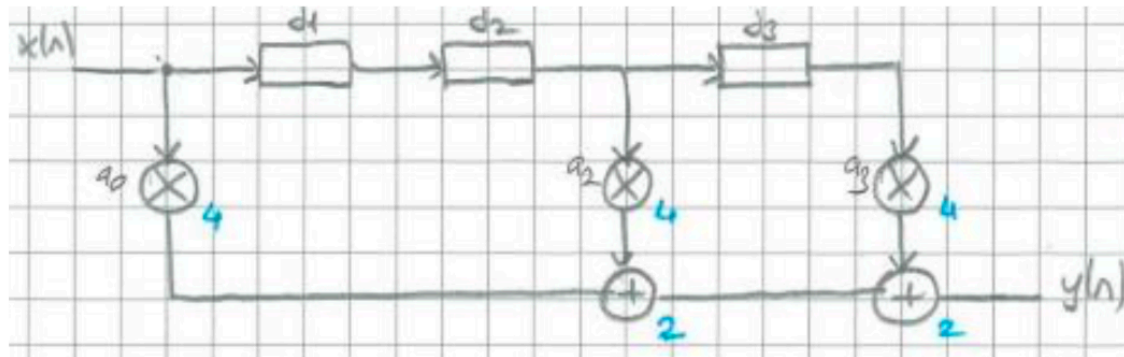
12 -1 -1 0

12 -1 -1 -1

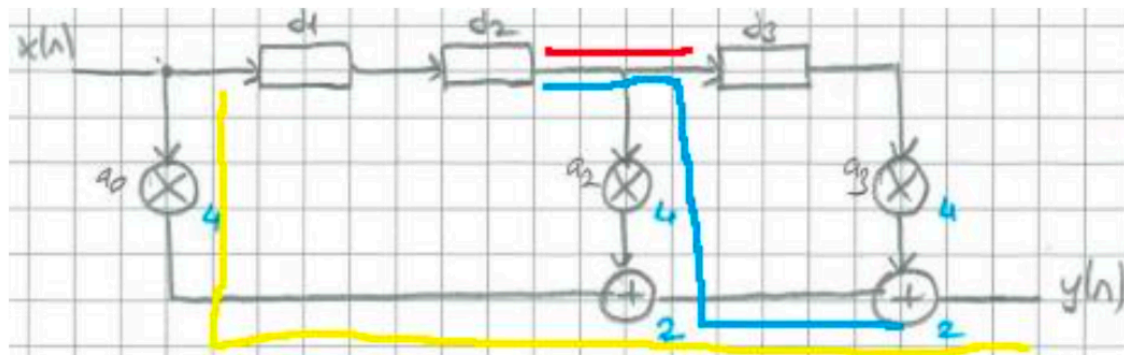
LPM \longrightarrow 8 u.t.

- 3. Consider an FIR filter $y(n) = a_0x(n) + a_2x(n-2) + a_3x(n-3)$ assume that the time required for 1 multiply operation is 4 u.t. and the time required for 1 add operation is 2 u.t.. Draw two types of direct-form realization structures of the above filter. What is the critical path length? What is the iteration bound?

Draw the DFG for FIR filter;



Critical path is ;



$$T_{\text{critical}} = 2 * TA + TM = 2 * 2ut + 4ut = 8ut$$

Loop does not exist. So iteration bound does not exist.