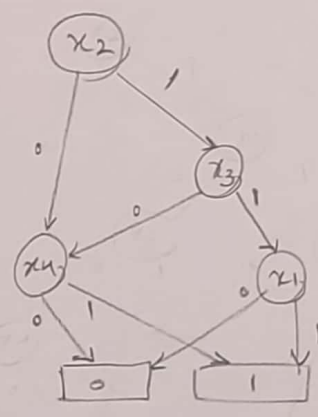
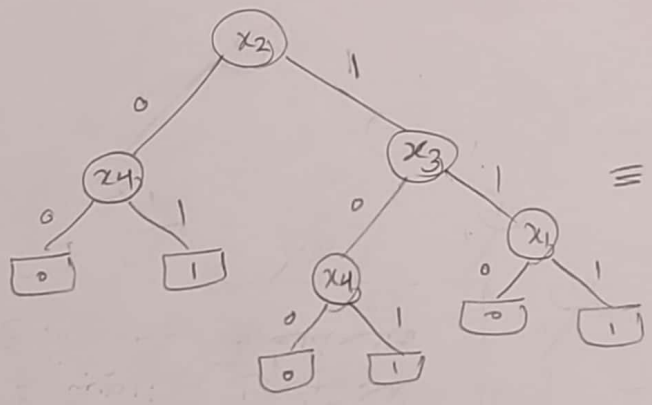


$$F = x_1 x_2 (x_3 + x_4) + x_1 \bar{x}_2 x_4 + \bar{x}_1 x_2 \bar{x}_3 x_4 + \bar{x}_1 \bar{x}_2 x_4 = x_2 (x_1 x_3 + x_1 x_4 + \bar{x}_1 \bar{x}_3 x_4) + \bar{x}_2 x_4$$

$$F = x_2 (x_1 (x_3 + x_4) + \bar{x}_1 (\bar{x}_3 x_4)) + \bar{x}_2 x_4 = x_2 (x_1 (x_3 + \bar{x}_3 x_4) + \bar{x}_1 \bar{x}_3 x_4) + \bar{x}_2 x_4 \rightarrow$$

$$F = x_2 (x_1 x_3 + \bar{x}_3 x_4) + \bar{x}_2 x_4 = x_2 (x_1 + \bar{x}_3) x_4 + \bar{x}_2 x_4$$



از 8 رأس به 6 رأس رسیدیم.

$$i) F = X S_1 S_0 + X S_1 \bar{S}_0 + X \bar{S}_1 \bar{S}_0 = X (S_1 + \bar{S}_0)$$

(206)

$$\textcircled{1} \begin{matrix} z=0 \\ S_1=0 \\ S_0=0 \end{matrix} \rightarrow H=G=0 \rightarrow F = (B_0 + \bar{z})(\bar{B}_0 + z) = 1 \rightarrow \begin{cases} z=0 \rightarrow B_0=0 \\ z=1 \rightarrow B_0=1 \end{cases}$$

$$\textcircled{2} \begin{matrix} x=0 \\ S_1=0 \\ S_0=1 \end{matrix} \rightarrow H=G=0 \rightarrow F = (B_1 + \bar{z})(\bar{B}_1 + z) = 1 \rightarrow \begin{cases} z=0 \rightarrow B_1=0 \\ z=1 \rightarrow B_1=1 \end{cases}$$

$$\textcircled{3} \begin{matrix} x=0 \\ S_1=1 \\ S_0=0 \end{matrix} \rightarrow H=G=0 \rightarrow F = (\bar{B}_1 + \bar{z})(B_1 + z) = 1 \rightarrow \begin{cases} z=0 \rightarrow B_1=1 \\ z=1 \rightarrow B_1=0 \end{cases}$$

$$\textcircled{4} \begin{matrix} x=0 \\ S_1=1 \\ S_0=1 \end{matrix} \rightarrow H=G=0 \rightarrow F = (B_2 + \bar{z})(\bar{B}_2 + z) = 1 \rightarrow \begin{cases} z=0 \rightarrow B_2=0 \\ z=1 \rightarrow B_2=1 \end{cases}$$

$$\textcircled{5} \begin{matrix} x=1 \\ S_1=0 \\ S_0=0 \end{matrix} \rightarrow H=G=1 \rightarrow F = (B_0 + \bar{z})(\bar{B}_0 + z) z = 1 \rightarrow z=1 \rightarrow B_0=1$$

$$\textcircled{6} \begin{matrix} x=1 \\ S_1=0 \\ S_0=1 \end{matrix} \rightarrow H=G=0 \rightarrow F = (B_1 + \bar{z})(\bar{B}_1 + z) \bar{z} = 1 \rightarrow z=0 \rightarrow B_1=0$$

$$\textcircled{7} \begin{matrix} x=1 \\ S_1=1 \\ S_0=0 \end{matrix} \rightarrow H=G=1 \rightarrow F = (\bar{B}_1 + \bar{z})(B_1 + z) z = 1 \rightarrow z=1 \rightarrow B_1=0$$

$$\textcircled{8} \begin{matrix} x=1 \\ S_1=1 \\ S_0=1 \end{matrix} \rightarrow H=G=1 \rightarrow F = (B_2 + \bar{z})(\bar{B}_2 + z) z = 1 \rightarrow z=1 \rightarrow B_2=1$$

$$\begin{matrix} B_0=1 \\ B_1=0 \\ B_2=1 \end{matrix}$$

$$ii) F = X S_1 S_0$$

$$\textcircled{1} \begin{matrix} x=0 \\ S_1=0 \\ S_0=0 \end{matrix} \rightarrow G=0 \rightarrow F = (B_0 + \bar{z})(\bar{B}_0 + z) \rightarrow \begin{cases} z=1 \rightarrow B_0=1 \\ z=0 \rightarrow B_0=0 \end{cases}$$

$$\textcircled{2} \begin{matrix} x=0 \\ S_1=0 \\ S_0=1 \end{matrix} \rightarrow G=0 \rightarrow F = (B_1 + \bar{z})(\bar{B}_1 + z) \rightarrow \begin{cases} z=0 \rightarrow B_1=0 \\ z=1 \rightarrow B_1=1 \end{cases}$$

$$\textcircled{3} \begin{matrix} x=0 \\ S_1=1 \\ S_0=0 \end{matrix} \rightarrow G=0 \rightarrow F = (\bar{B}_1 + \bar{z})(B_1 + z) \rightarrow \begin{cases} z=0 \rightarrow B_1=1 \\ z=1 \rightarrow B_1=0 \end{cases}$$

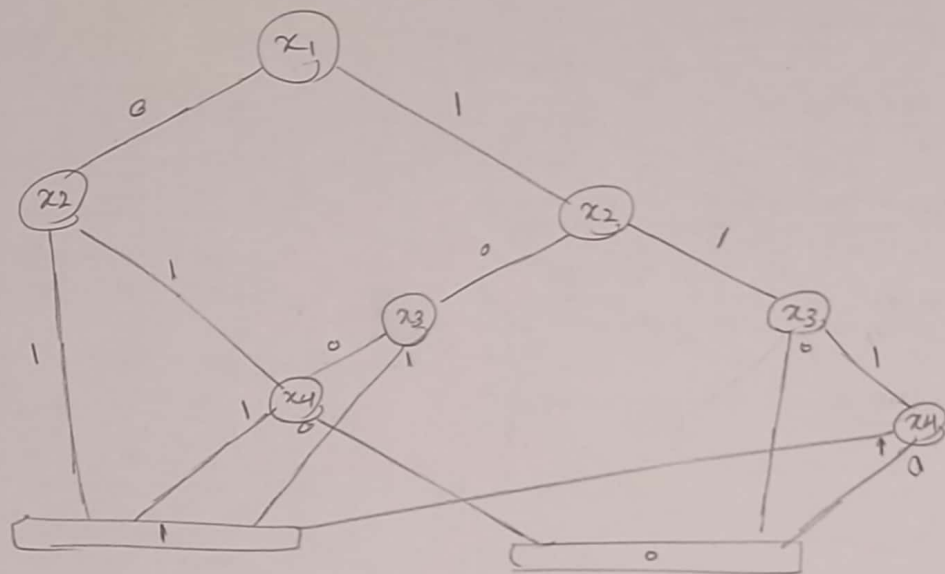
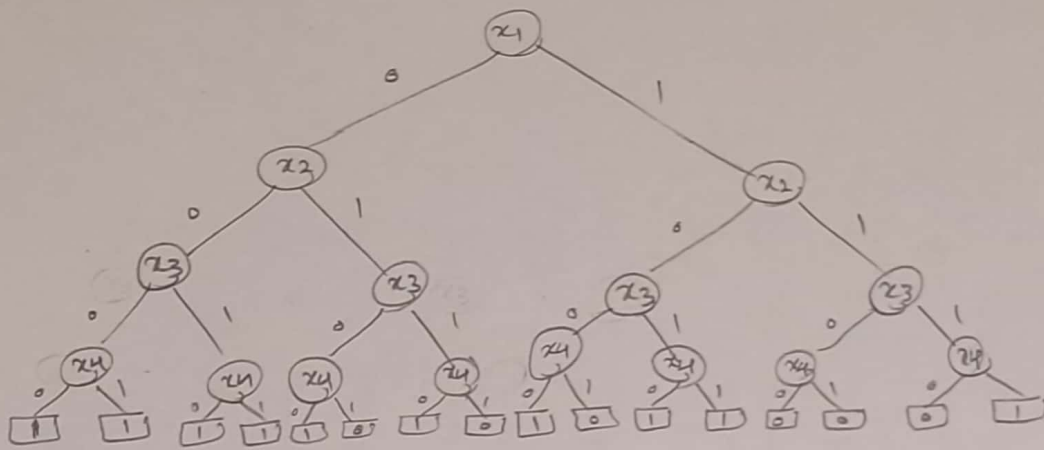
$$\textcircled{4} \begin{matrix} x=0 \\ S_1=1 \\ S_0=1 \end{matrix} \rightarrow G=0 \rightarrow F = (B_2 + \bar{z})(\bar{B}_2 + z) \rightarrow \begin{cases} z=0 \rightarrow B_2=1 \\ z=1 \rightarrow B_2=0 \end{cases}$$

$$\textcircled{5} \begin{matrix} x=1 \\ S_1=0 \\ S_0=0 \end{matrix} \rightarrow G=0 \rightarrow F = (B_0 + \bar{z})(\bar{B}_0 + z) \bar{z} \rightarrow z=0 \rightarrow B_0=0$$

$$\textcircled{6} \begin{matrix} x=1 \\ S_1=0 \\ S_0=1 \end{matrix} \rightarrow G=0 \rightarrow F = (B_1 + \bar{z})(\bar{B}_1 + z) \bar{z} \rightarrow z=0 \rightarrow B_1=0$$

$$\textcircled{7} \begin{matrix} x=1 \\ S_1=1 \\ S_0=0 \end{matrix} \rightarrow G=0 \rightarrow F = (\bar{B}_1 + \bar{z})(B_1 + z) \bar{z} \rightarrow z=0 \rightarrow B_1=1$$

conflict



0000
0001
0010
0100
1000
0011
0110
1010
1011
1111

000x
00x0
0x00
x000
00x1
001x
0x10
x010
x011
101x
1x11

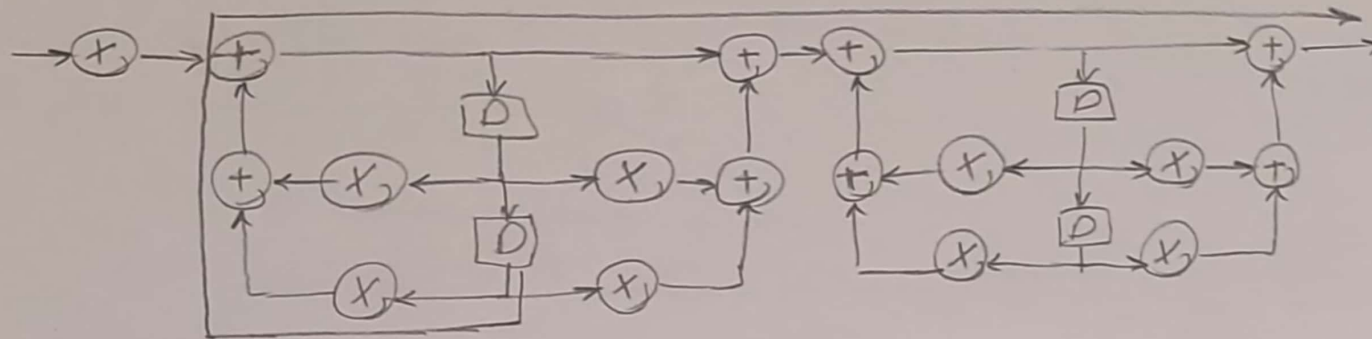
00xx
0xx0
x0x0
x01x
1x11

	0	1	2	3	4	6	8	10	11	15
00xx	X	(X)	X	X						
0xx0	X		X		(X)	(X)				
x0x0	X		X				(X)	X		
x01x			X	X				X	X	
1x11									X	(X)

→ {00xx, 0xx0, x0x0, x01x, 1x11}

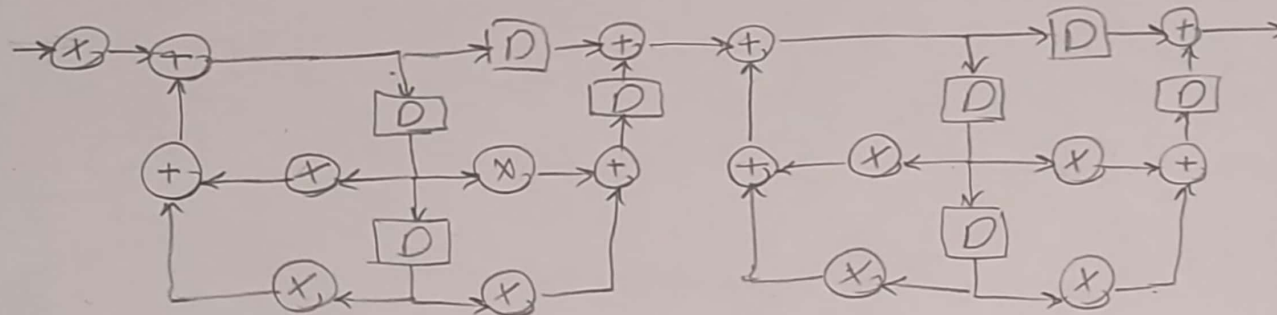
حالت x01x حذف شود

(40b)



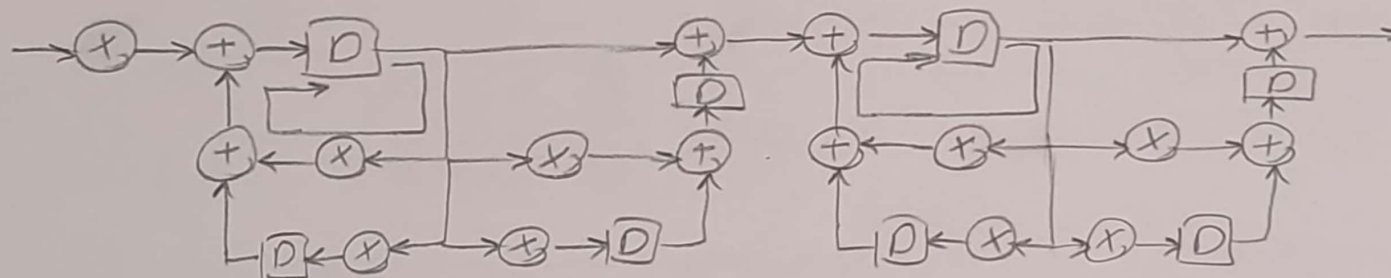
(a)

Critical path = $m + 5a = 2 + 5 = 7ns \rightarrow f = \frac{1}{7ns} = 142.85 \text{ MHz}$



(b)

کد شده با بلوک شده
retiming
انجام بدیم.



Critical path = $m + 2a = 4ns \rightarrow f = \frac{1}{4ns} = 250 \text{ MHz}$