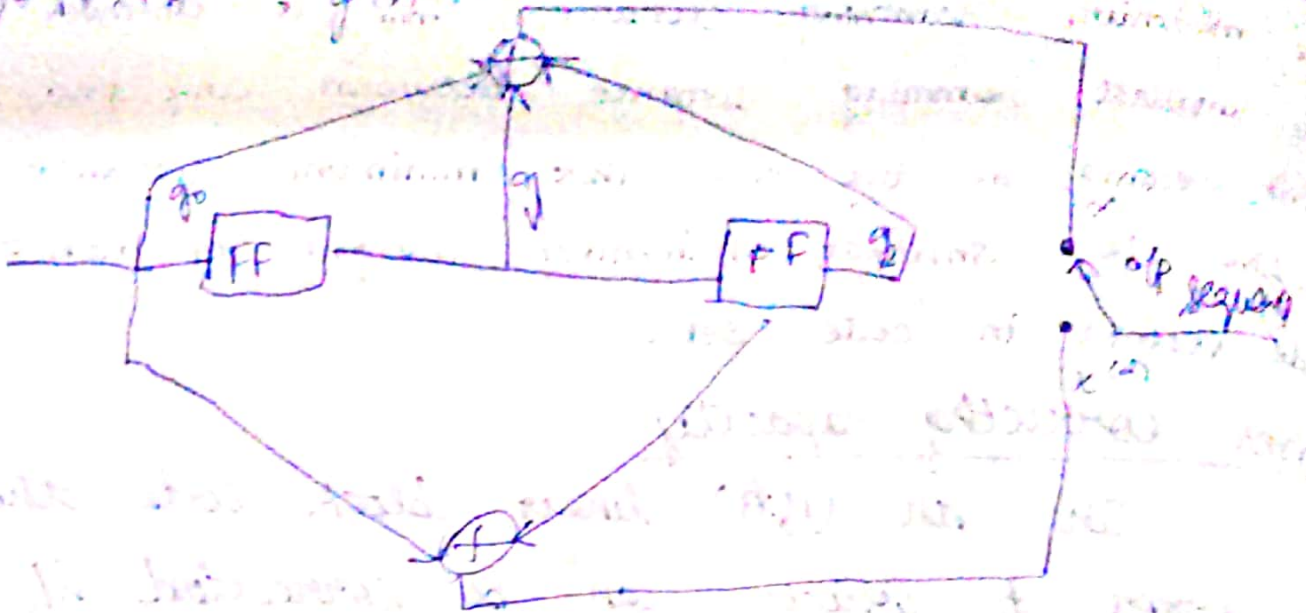


$$g(x) = 1 + x + x^2 \Rightarrow g'(x) = 1 + x^2$$

if  
next  
seques



$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$m_0 \quad m_1 \quad m_2 \quad m_3 \quad m_4$

Time domain approach

$$\begin{aligned} x_0^{(1)} &= g_0 m_0 + g_1 \cdot 0 + g_2 \cdot 0 \\ &= 1 \cdot 1 + 1 \cdot 0 + 1 \cdot 0 \\ &= 1 \end{aligned}$$

$$\begin{aligned} x_1^{(1)} &= g_0 m_1 + g_1 m_0 + g_2 \cdot 0 \\ &= 1 \cdot 0 + 1 \cdot 1 + 1 \cdot 0 \\ &= 1 \end{aligned}$$

$$\begin{aligned} x_2^{(1)} &= g_0 m_2 + g_1 m_1 + g_2 m_0 \\ &= 1 \cdot 0 + 1 \cdot 0 + 1 \cdot 1 \\ &= 1 \end{aligned}$$

$$\begin{aligned} x_3^{(1)} &= g_0 m_3 + g_1 m_2 + g_2 m_1 \\ &= 1 \cdot 1 + 1 \cdot 0 + 1 \cdot 0 \\ &= 1 \end{aligned}$$

$$\begin{aligned} x_0^{(2)} &= g_0 m_0 + g_1 \cdot 0 + g_2 \cdot 0 \\ &= 1 \cdot 1 + 0 \cdot 0 + 0 \cdot 0 \\ &= 1 \end{aligned}$$

$$\begin{aligned} x_1^{(2)} &= g_0 m_1 + g_1 m_0 + g_2 \cdot 0 \\ &= 0 \end{aligned}$$

$$\begin{aligned} x_2^{(2)} &= g_0 m_2 + g_1 m_1 + g_2 m_0 \\ &= 1 \end{aligned}$$

$$\begin{aligned} x_3^{(2)} &= g_0 m_3 + g_1 m_2 + g_2 m_1 \\ &= 1 \cdot 1 + 0 \cdot 0 + 1 \cdot 0 \\ &= 1 \end{aligned}$$

$$x_4^{(1)} = g_0 m_4 + g_1 m_3 + g_2 m_2$$

$$= 1 + 1 + 0$$

$$= 0$$

$$x_4^{(2)} = g_0 m_4 + g_1 m_3 + g_2 m_2$$

$$= 1 + 0 + 0$$

$$= 1$$

~~11, 10, 11, 11, 01, 01, 11~~

$$x_5^{(1)} = g_0 0 + g_1 m_4 + g_2 m_3$$

$$= 0 + 1 + 0$$

$$= 0$$

$$x_5^{(2)} = g_0 0 + g_1 m_4 + g_2 m_3$$

$$= 0 + 0 + 1$$

$$= 1$$

$$x_6^{(1)} = g_1 m_4$$

$$= 1$$

$$x_6^{(2)} = g_2 m_4$$

$$= 0$$

O/P  $\Rightarrow$  11, 10, 11, 11, 01, 01, 11

### Transform - Domain Approach

$$g^1(x) = 1 + x + x^2$$

$$g^2(x) = 1 + x^2$$

Message = 10011

$$m(x) = 1 + x^3 + x^4$$

$$g^1(x) = g^1(x)m(x) = (1 + x + x^2)(1 + x^3 + x^4)$$

$$= (1 + x^3 + x^4 + x + x^4 + x^5 + x^2 + x^5 + x^6)$$

$$= 1 + x + x^2 + x^3 + 2x^4 + 2x^5 + x^6 \quad (1111001)$$

$$g^2(x) = g^2(x)m(x) = (1 + x^2)(1 + x^3 + x^4)$$

$$= 1 + x^3 + x^4 + x^2 + x^5 + x^6$$

$$= 1 + x^2 + x^3 + x^4 + x^5 + x^6 \quad (1011111)$$

O/P  $\Rightarrow$  11, 10, 11, 11, 01, 01, 11

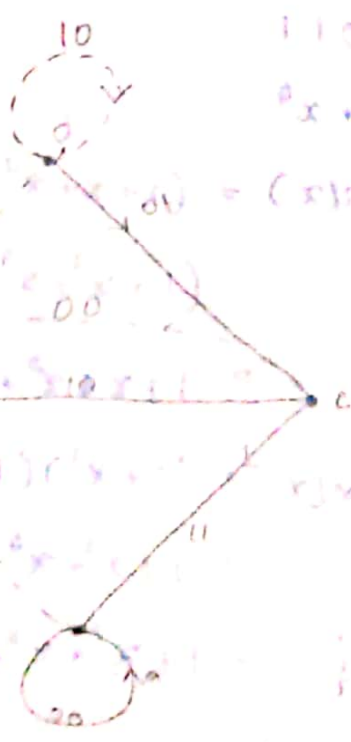
State table

Message Bits	Present State		State Label	Next state		State Label	O/P <sup>(1)</sup>		O/P <sup>(2)</sup>	Crude O/p
	FF1	FF2		FF1	FF2		M	FF1FF2		
0	0	0	a	0	0	a	0	0	00	
1	0	0	a	1	0	b	1	1	11	
0	1	0	b	0	1	c	1	0	10	
1	1	0	b	1	1	d	0	1	01	
0	0	1	c	0	0	a	1	1	11	
1	0	1	c	1	0	b	0	0	00	
0	1	1	d	0	1	c	0	1	01	
1	1	1	d	1	1	d	1	1	10	

10011

a → ilp 1 → 11  
 b → ilp 0 → 10  
 c → ilp 0 → 11  
 d → ilp 1 → 10

11, 10, 11, 11, 01, 01, 11  
 11, 10, 11, 11, 01, 01, 11



$x^2 + x + 1 = (x)^2 p$   
 $x + 1 = (x)^2 p$   
 $x^2 + x + 1 = (x)^2 p$   
 $x^2 + x + 1 = (x)^2 p$

11, 10, 11, 11, 01, 11