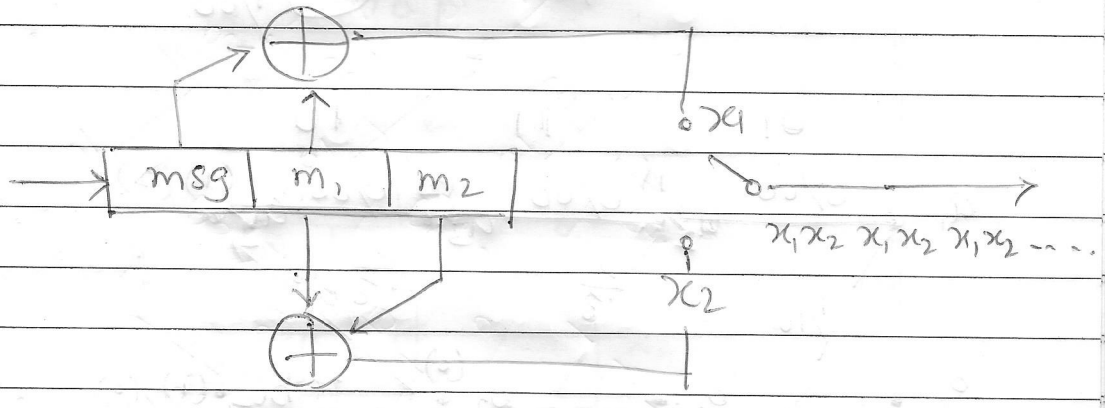
Draw the state diagram, trellis diagram for the convolutional encoder below. Also decode the received sequence [01 11 10] using Viterbi algorithm.



msg	Prev State		next state		Output	
	m_1	m_2	m_1'	m_2'	x_1	x_2
0	0	0	0	0	0	0
1	0	0	1	0	1	0
0	0	1	0	0	0	1
1	0	1	1	0	1	1
0	1	0	0	1	1	1
1	1	0	1	1	0	1
0	1	1	0	1	1	0
1	1	1	1	1	0	0

$x_1 = msg \oplus m_1$

~~$x_2 = msg$~~

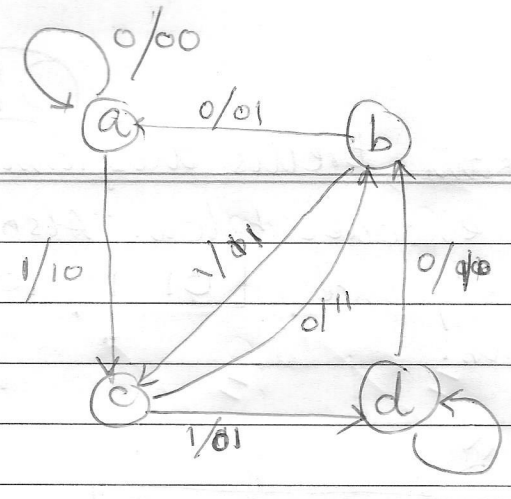
$x_2 = m_1 \oplus m_2$

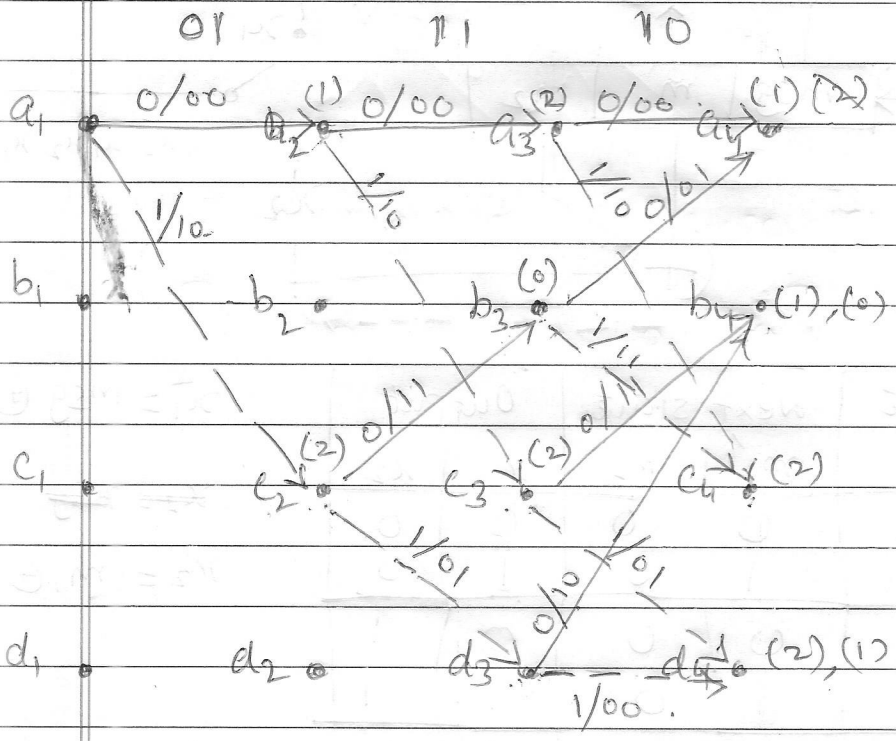
00 a

01 b

10 c

11 d





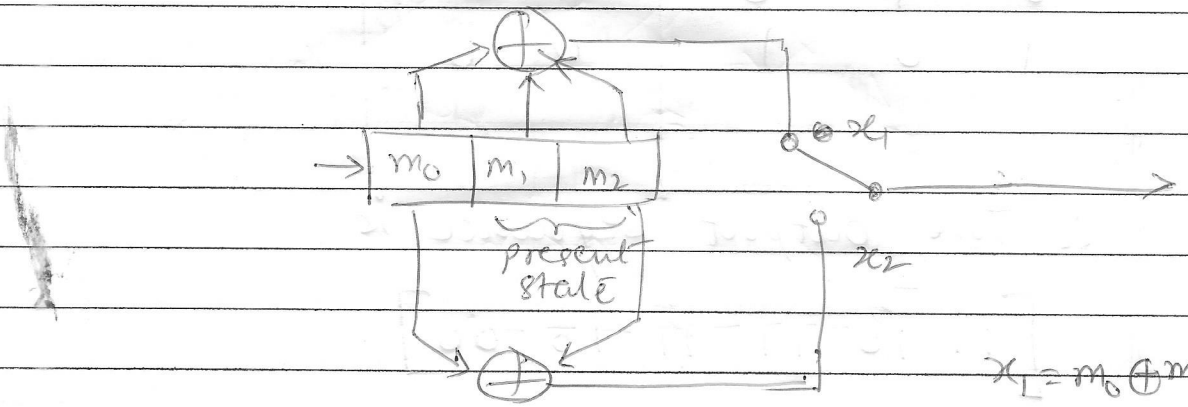
$a_1\ a_2\ a_3\ a_4$	$1+2+1=4$
$a_1\ c_2\ b_3\ a_4$	$2+0+2=4$
$a_1\ a_2\ c_3\ b_4$	$1+1+1=3$ – [00 10 01]
$a_1\ c_2\ d_3\ b_4$	$2+1+0=3$ – [10 01 10]
$a_1\ a_2\ a_3\ c_4$	$1+2+0=3$ – [00 00 10]
$a_1\ c_2\ b_3\ c_4$	$2+0+1=3$ – [10 11 11]
$a_1\ a_2\ c_3\ d_4$	$1+1+2=4$
$a_1\ c_2\ d_3\ d_4$	$2+1+1=4$

[00 10 01] = [0 1 1]
[10 01 10] = [1 1 0]
[00 00 10] = [0 0 1]
[10 11 11] = [1 0 1]

A convolutional encoder has the following generator sequences

$(g_0^{(1)}, g_1^{(1)}, g_2^{(1)}) = (1,1,1)$ $(g_0^{(2)}, g_1^{(2)}, g_2^{(2)}) = (1,0,1)$

Determine the encoded sequence for the input message $m = 100101$

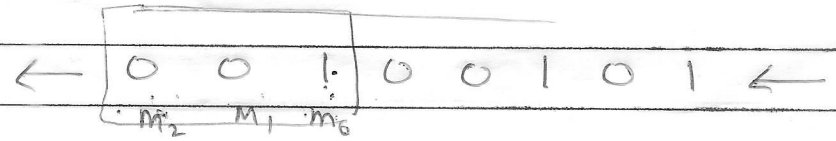


$x_1 = m_0 \oplus m_1 \oplus m_2$

$x_2 = m_0 \oplus m_2$

m_0	m_1	m_2	m_1'	m_2'	x_1	x_2
0	0	0	0	0	0	0
1	0	0	1	0	1	1
0	0	1	0	0	1	1
1	0	1	1	0	0	0
0	1	0	0	1	1	0
1	1	0	1	1	0	1
0	1	1	0	1	0	1
1	1	1	1	1	1	0

For the $m = 100101$, consider the sliding window (assuming that initial state = 00)



m_2 m_1 m_0

m_2 m_1 m_0

m_2 m_1 m_0

m_2 m_1 m_0

m_2 m_1 m_0

m_0	m_1	m_2	x_1	x_2
1	0	0	1	1
0	1	0	1	0
0	0	1	1	1
1	0	0	1	1
0	1	0	1	0
1	0	1	0	0

∴ The output sequence is

[11 10 11 11 10 00]

Draw the tree diagram and the trellis diagram for the convolution encoder shown below.