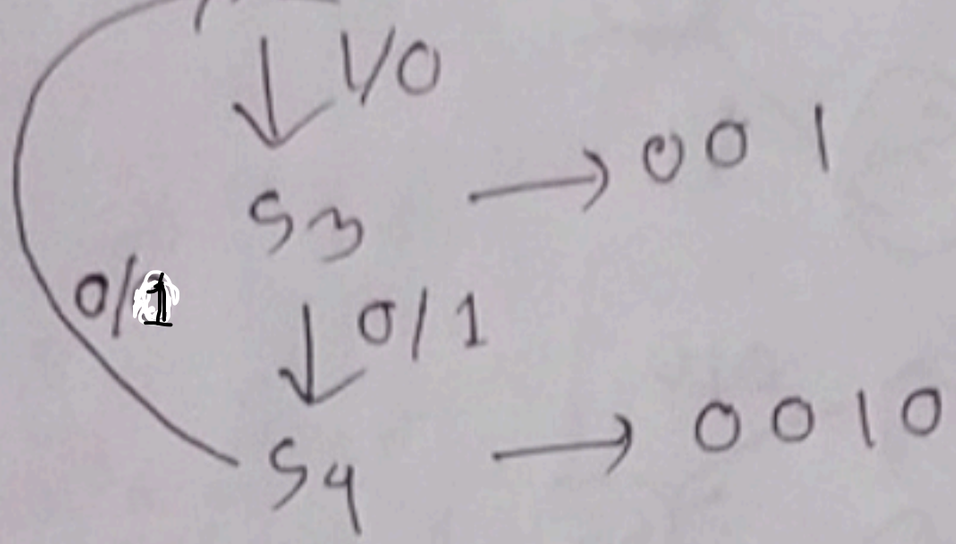
16.1

Sequence Detector

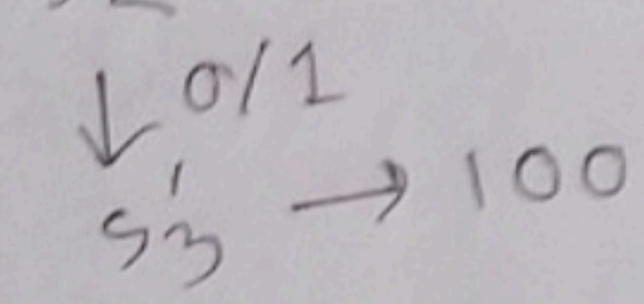
0010 and 100

Step-1:

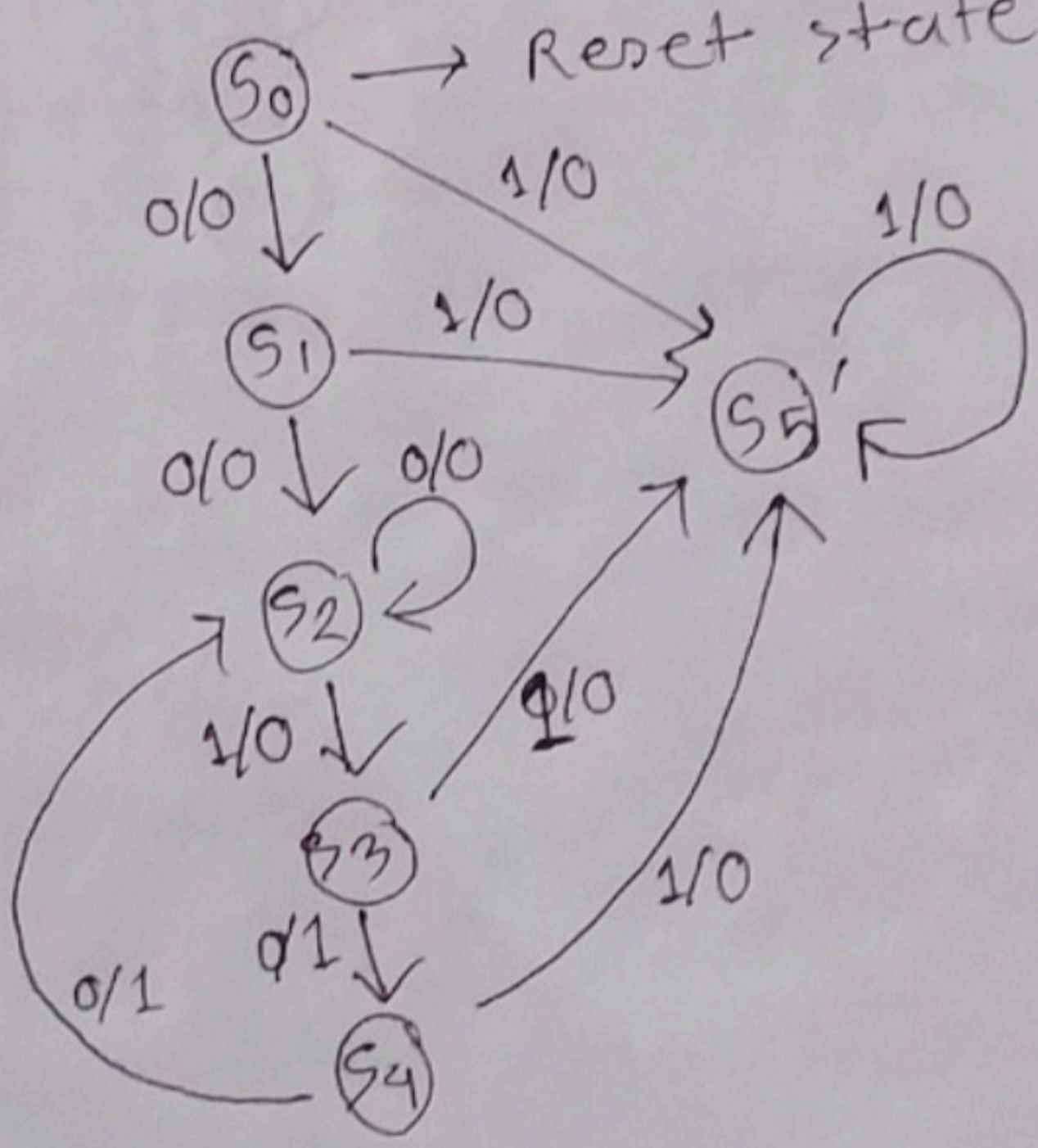
For 0010 only,



For 100 only



Combining the two state diagram.



Here, $S_0 = 000$

$S_1 = 001$

$S_2 = 010$

$S_3 = 011$

$S_4 = 100$

$S_5 = 101$

State table:

Present State			Input	Next state			Output
Q_A	Q_B	Q_C	x	Q_{A^+}	Q_{B^+}	Q_{C^+}	Y
0	0	0	0	0	0	1	0
0	0	0	1	1	0	1	0
0	0	1	0	0	1	0	0
0	0	1	1	1	0	1	0
0	1	0	0	0	1	0	0
0	1	0	1	0	1	1	0
0	1	1	0	1	0	0	1
0	1	1	1	1	0	1	0
1	0	0	0	0	1	0	1
1	0	0	1	1	0	1	0
1	0	1	0	1	0	0	0
1	0	1	1	1	0	1	0

For, $Q_A^t = D_A$

$Q_A Q_B$ \ $Q_C x$	00	01	11	10
00	0	1	1	0
01	0	0	1	1
11	x	x	x	x
10	0	1	1	1

$D_A = Q_A^t = \bar{Q}_B x + Q_B Q_C + Q_A Q_C$

For $Q_B^t = D_B$

$Q_A Q_B$ \ $Q_C x$	00	01	11	10
00	0	0	0	1
01	1	1	0	0
11	x	x	x	x
10	1	0	0	0

$D_B = Q_B^t = Q_B \bar{Q}_C + \bar{Q}_A \bar{Q}_B Q_C x + Q_A \bar{Q}_C \bar{x}$

For, $Q_C^t = D_C$

$Q_A Q_B$ \ $Q_C x$	00	01	11	10
00	1	1	1	0
01	0	1	1	0
11	x	x	x	x
10	0	1	1	0

$Q_C^t = D_C = x + \bar{Q}_A \bar{Q}_B \bar{Q}_C$

$Q_A Q_B$ \ $Q_C x$	00	01	11	10
00	0	0	0	0
01	0	0	0	1
11	x	x	x	x
10	1	0	0	0

$Y = Q_A \bar{Q}_C \bar{x} + \bar{Q}_B Q_C \bar{x}$

$Q_A^t = \bar{Q}_B x + Q_B Q_C + Q_A Q_C$

$= \overline{\bar{Q}_B x} \cdot \overline{Q_B Q_C} \cdot \overline{Q_A Q_C}$

$Q_C^t = x + \bar{Q}_A \bar{Q}_B \bar{Q}_C$

$= \overline{\bar{x}} \cdot \overline{\bar{Q}_A \bar{Q}_B \bar{Q}_C}$

$Q_B^t = Q_B \bar{Q}_C + \bar{Q}_A \bar{Q}_B Q_C \bar{x} + Q_A \bar{Q}_C \bar{x}$

$= \overline{Q_B \bar{Q}_C} \cdot \overline{\bar{Q}_A \bar{Q}_B Q_C \bar{x}} \cdot \overline{Q_A \bar{Q}_C \bar{x}}$

$Y = Q_A \bar{Q}_C \bar{x} + \bar{Q}_B Q_C \bar{x}$

$= \overline{Q_A \bar{Q}_C \bar{x}} \cdot \overline{\bar{Q}_B Q_C \bar{x}}$