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CS220 Computer Architecture

Practical 7 Report

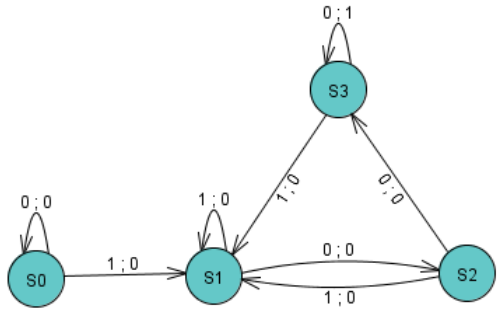
Circuit Description

A synchronous sequential circuit that has a single input X and a single output Z.

- *Z is to turn on when the pattern 100 is sampled on X (on successive clock pulses).*
- *Z is then to remain on until X is sampled as 1.*

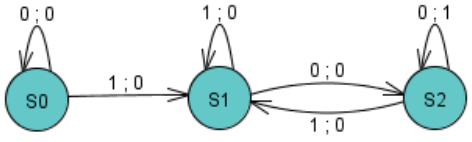
Design Details

1. *Construct a state transition diagram and table.*



X \ S	S0	S1	S2	S3
0	S0/0	S2/0	S3/1	S3/1
1	S1/0	S1/0	S1/0	S1/0

2. *Eliminate redundant state for S2 and S3 are equivalent and make state assignment.*



S0	00
S1	01
S2	10

3. *Derive Boolean expressions using K–Maps.*

X \ Q1Q0	00	01	11	10
0	00/0	10/0	XX/X	10/1
1	01/0	01/0	XX/X	01/0

X \ Q1Q0	00	01	11	10
0	0	1	X	1
1	0	0	X	0

$$Q_1^* = \overline{X}Q_0\overline{Q_1} + \overline{X}Q_1$$
$$J_1 = \overline{X}Q_0$$
$$K_1 = X$$

X \ Q1Q0	00	01	11	10
0	0	0	X	0
1	1	1	X	1

$$Q_0^* = X\overline{Q_0} + XQ_0$$
$$J_1 = X$$
$$K_1 = \overline{X}$$

X \ Q1Q0	00	01	11	10
0	0	0	X	1
1	0	0	X	0

$$Z = Q_1\overline{X}$$

Circuit schematic