

Homework #3

Figure 7-56 gives the outputs for each state,
 no 2 states have the same outputs.
 \therefore no equivalent states exist

The state transition table is given in
 Table 7-14 (pg 576). Since there
 are 3 FFs and 3 inputs you can't
 use 1 K-map.

Fortunately, Q_1 and Q_0 are simple
 enough so that K-maps may not be req'd.

e.g., Q_0 (equivalently P_0) = 1 when

$$\begin{aligned}
 D_0 &= \bar{Q}_2 \cdot \bar{Q}_1 \cdot \bar{Q}_0 \cdot [L \cdot \bar{R} \cdot \bar{H} + \bar{L} \cdot R \cdot \bar{H}] \\
 &\quad + \underbrace{\bar{Q}_2 \cdot \bar{Q}_1 \cdot Q_0 \cdot \bar{H} + Q_2 \cdot \bar{Q}_1 \cdot Q_0 \cdot H}_{\bar{Q}_1 \cdot Q_0 \cdot \bar{H}} \\
 &= \bar{Q}_2 \cdot \bar{Q}_1 \cdot \bar{Q}_0 \cdot \bar{H} \cdot [L \oplus R]
 \end{aligned}$$

$$\begin{aligned}
 D_1 &= \underbrace{\bar{Q}_2 \cdot \bar{Q}_1 \cdot Q_0 \cdot \bar{H} + \bar{Q}_2 \cdot Q_1 \cdot Q_0 \cdot \bar{H}}_{\bar{Q}_2 \cdot Q_0 \cdot \bar{H}} \\
 &\quad + \underbrace{Q_2 \cdot \bar{Q}_1 \cdot Q_0 \cdot H + Q_2 \cdot Q_1 \cdot Q_0 \cdot H}_{Q_2 \cdot Q_0 \cdot \bar{H}} \\
 &= Q_0 \cdot \bar{H}
 \end{aligned}$$

for D_3 notice that 6 of the 8 times it is a logic 1 it is only a function of HQ_2, Q_2, Q_1 , and Q_0

HQ_2	Q_1, Q_0	00	01	11	10
00					
01		1	1		
11		1	1		
10		1	1		

$$D_{3A} = H \cdot Q_0 + Q_2 \cdot Q_0$$

for the last 2 instances $Q_2 = Q_1 = Q_0$, So

H	00	01	11	10
0		1	1	
1	1	1	1	1

$$D_{3B} = \bar{Q}_2 \bar{Q}_1 \bar{Q}_0 \cdot [H + R]$$

$$\therefore D = D_{3A} + D_{3B}$$

$$\begin{aligned}
 &= H \cdot Q_0 + Q_2 \cdot Q_0 + \bar{Q}_2 \bar{Q}_1 H \\
 &\quad + \bar{Q}_2 \bar{Q}_1 \bar{Q}_0 R
 \end{aligned}$$

$Q_1 Q_0$	00	01	11	10
Q_2				
0				1
1	1			

$$LC = Q_2 \bar{Q}_1 \bar{Q}_0 + \bar{Q}_2 Q_1 \bar{Q}_0$$

$Q_1 Q_0$	00	01	11	10
Q_2				
0				
1	1		1	1

$$LB = Q_2 \bar{Q}_1 \bar{Q}_0 + \bar{Q}_2 Q_1$$

$Q_1 Q_0$	00	01	11	10
Q_2				
0				
1	1	1	1	1

$$LA = Q_2 \bar{Q}_1 \bar{Q}_0 + \bar{Q}_2 Q_0 + \bar{Q}_2 Q$$

$Q_1 Q_0$	00	01	11	10
Q_2				
0				
1	1	1	1	1

$$RA = Q_2$$

$Q_1 Q_0$	00	01	11	10
Q_2				
0				
1	1	1	1	1

$$RB = Q_2 \bar{Q}_0 + Q_2 Q_1$$

$Q_1 Q_0$	00	01	11	10
Q_2				
0				
1	1			1

$$RC = Q_2 \bar{Q}_0$$