

This was an extension of the quiz we had and went over the solution for in class. Therefore, the truth table is the same as the one for the quiz, which is:

A ₁	A ₀	B ₁	B ₀	L ₂	L ₁	L ₀
0	0	0	0	0	0	0
0	0	0	1	0	0	1
0	0	1	0	0	1	0
0	0	1	1	0	1	1
0	1	0	0	0	0	1
0	1	0	1	0	1	0
0	1	1	0	0	1	1
0	1	1	1	1	0	0
1	0	0	0	0	1	0
1	0	0	1	0	1	1
1	0	1	0	1	0	0
1	0	1	1	1	0	1
1	1	0	0	0	1	1
1	1	0	1	0	1	0
1	1	1	0	1	0	1
1	1	1	1	1	1	0

From this table, we can find the KMaps for L₂, L₁ and L₀, which we can use to get the equations. The KMaps are as follows:

L ₂	00	01	11	10
00				
01			1	
11			1	1
10			1	1

L ₁	00	01	11	10
00			1	1
01		1		1
11	1	1	1	
10	1	1		

L ₀	00	01	11	10
00		1	1	
01	1			1
11	1			1
10		1	1	

Using the KMaps as circled above, we get the following minimum sum of product equations:

$$L_2 = A_0 B_1 B_0 + A_1 B_1, \quad L_1 = A_1' A_0' B_1 + A_1' B_1 B_0' + A_1 A_0 B_0 + A_0 B_1' B_0 + A_1 B_1, \quad L_0 = A_0' B_0 + A_0 B_0' = A_0 \text{ XOR } B_0$$

The following screenshots show the completed circuit in all variations:































