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:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| A1 | A0 | B1 | B0 | L2 | L1 | L0 |
| 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:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| L2 | 00 | 01 | 11 | 10 |
| 00 |  |  |  |  |
| 01 |  |  | 1 |  |
| 11 |  |  | 1 | 1 |
| 10 |  |  | 1 | 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| L1 | 00 | 01 | 11 | 10 |
| 00 |  |  | 1 | 1 |
| 01 |  | 1 |  | 1 |
| 11 | 1 | 1 | 1 |  |
| 10 | 1 | 1 |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| L0 | 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:

L2 = A0B1B0 + A1B1, L­1 = A1’A0’B1 + A1’B1B­­0’ + A1A0B0 + A0B1’B0­ + A1B1, L0 = A0’B0 + A0B0’ = A0 XOR B0

The following screenshots show the completed circuit in all variations:

A diagram of a circuit

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