**Lab 1 Specification**

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**Truth Table:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Row | X3 | X2 | X1 | X0 | Y2 | Y1 | Y0 |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 2 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 3 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 4 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 5 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 6 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 7 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 8 | 0 | 1 | 1 | 1 | 0 | 1 | 0 |
| 9 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 10 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 11 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 12 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 13 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 14 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 15 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 16 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |

Based on the number of bits in the input, the truth table should have 16 rows.

**sum of products:**

based on row 1 and row 16:

Y2 = X3' X2' X1' X0' + X3 X2 X1 X0;

Based on row 2, 3, 5, 8, 9, 12, 14, 15:

Y1 = X3' X2' X1' X0 + X3' X2' X1 X0' + X3' X2 X1' X0' + X3' X2 X1 X0 + X3 X2' X1' X0' + X3 X2' X1 X0 + X3 X2 X1' X0 + X3 X2 X1 X0';

Y0 always is 0:

Y0 = 0;

Simplify:

Y2 = X3' X2' X1' X0' + X3 X2 X1 X0;

Y1 = X3 X2' X1' X0' + X3' X2 X1' X0' + X3' X2' X1 X0' + X3 X2 X1 X0' + X3' X2' X1' X0 + X3 X2 X1' X0 + X3 X2' X1 X0 + X3' X2 X1 X0;

Y0 = 0;