Mini Project Answer Sheet

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Date: _3/01/22_
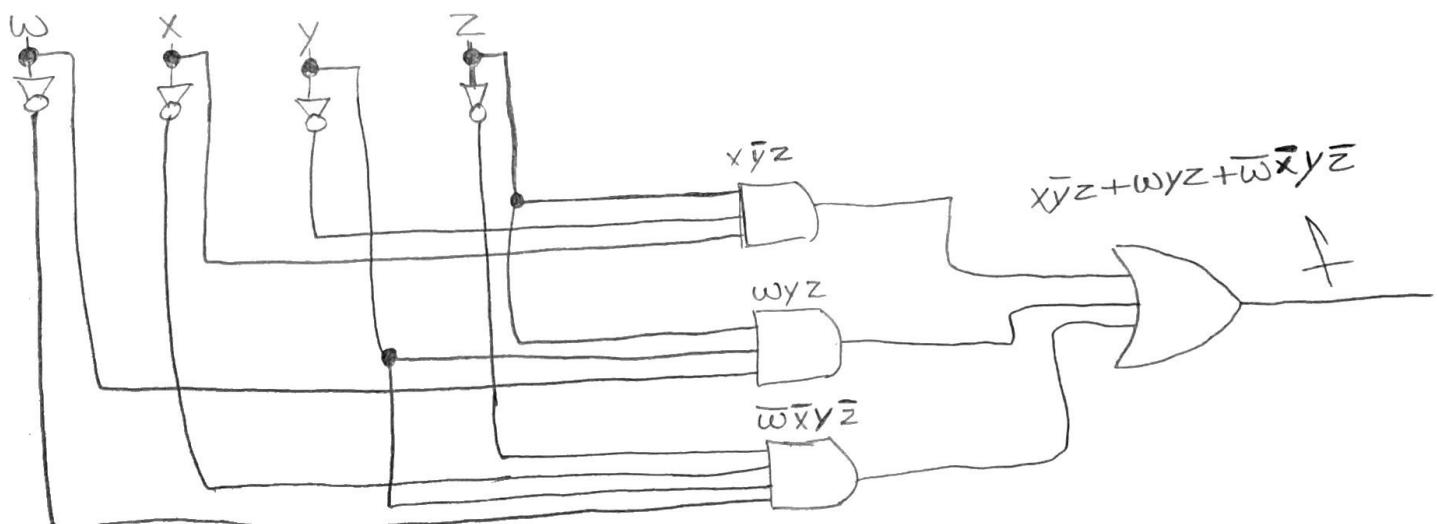
PRELAB:

Read the Mini-Project lab document and complete as much of this answer sheet as you can before lab.

TA Initials: _____

LAB:

4.0 Draw Uncle Bob's circuit below, using only AND, OR, and NOT gates. NAND → SOP

$x\bar{y}z$

wyz

$\overline{w}\,\overline{x}y\overline{z}$

$x\bar{y}z + wyz + \overline{w}\,\overline{x}y\overline{z}$

f

● Bob's Circuit = $x\bar{y}z + wyz + \overline{w}\,\overline{x}y\overline{z}$

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5.0 Give the shorthand canonical SOP expression for Uncle Bob's circuit and then the Verilog code which implements this behavior:

B(W, X, Y, Z) = $X\bar{Y}Z + WYZ + \bar{W}\bar{X}Y\bar{Z}$

Verilog:
```
module mProjStep1(F,W,X,Y,Z);
    input W,X,Y,Z;
    output F;
    assign F = (x&~y&z)|(w&y&z)|(~w&~x&y&~z);
endmodule
```
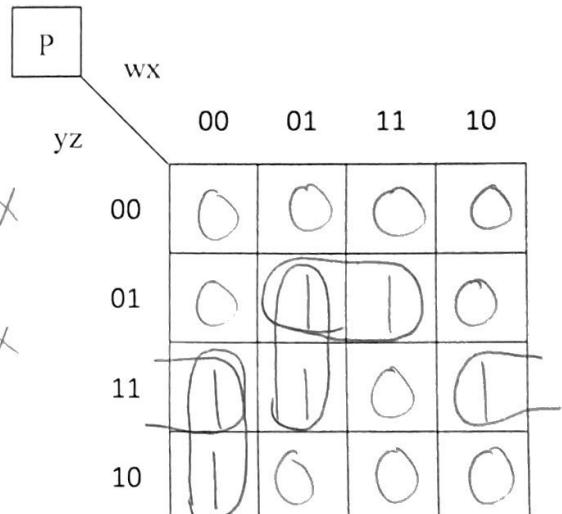
Demonstration of Quartus Results:_____

6.0 Truth table for Uncle Bob's function B and the 4-bit prime detector function P.

W	X	Y	Z	B	P
0	0	0	0	0	0
0	0	0	1	0	0
0	0	1	0	1	1
0	0	1	1	0	1
0	1	0	0	0	0
0	1	0	1	1	1
0	1	1	0	0	0
0	1	1	1	0	1
1	0	0	0	0	0
1	0	0	1	0	0
1	0	1	0	0	0
1	0	1	1	1	1
1	1	0	0	0	0
1	1	0	1	1	1
1	1	1	0	0	0
1	1	1	1	1	0

P \ wx → yz ↓	00	01	11	10
00	0	0	0	0
01	0	1	1	0
11	1	1	0	1
10	1	0	0	0

Simplified SOP Expression:

$$P(W, X, Y, Z) = \overline{W}\overline{X}Y + \overline{X}YZ + \overline{W}XZ + X\overline{Y}Z$$

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7.0 Give your implementation of the correct 4-bit prime detector circuit (**P**) below as either Verilog or a schematic (your choice). Then demonstrate the results:

```
module mProjStep2( F,W,X,Y,Z);
    input W,X,Y,Z;
    output F;
    assign F=(~W&~X&Y)|(~X&Y&Z)|(~W&X&Z)|(X&~Y&Z);
endmodule
```

Demonstration of ModelSim Results:_____

8.0 Design and implement a circuit that uses Uncle Bob's circuit but fixes his mistakes. Draw it below and demonstrate the results:

Demonstration of ModelSim Results:_____