CSCI 2150 – Karnaugh Map Homework

Name: ________________________________

1. Derive the minimum SOP expression from the Karnaugh map below. Be sure to show all steps.

AB \ C	0	1
00	1	1
01	0	0
11	0	1
10	1	1

Blue 2x2 Rectangle

A	B	C
0	0	0
0	0	1
1	0	0
1	0	1

Red 2x1 Rectangle

A	B	C
1	1	1
1	0	1

Since the only term that stays constant for the 2x2 blue rectangle is B = 0, then the product for that rectangle is simply $\overline{B}$. In the second rectangle, the red one, the terms that remain constant across all cells are A = 1 and C = 1. Therefore, the product for that rectangle is $A \cdot C$. This gives us the minimum SOP expression:

$$\boxed{\overline{B} + A \cdot C}$$

2. Derive the minimum SOP expression from the Karnaugh map below. Be sure to show all steps.

AB \ CD	00	01	11	10
00	1	1	0	1
01	0	0	0	0
11	0	0	1	0
10	1	1	1	0

Blue 2x2 Rectangle

A	B	C	D
0	0	0	0
0	0	0	1
1	0	0	0
1	0	0	1

Green 1x2 Rectangle

A	B	C	D
0	0	0	0
0	0	1	0

Red 2x1 Rectangle

A	B	C	D
1	1	1	1
1	0	1	1

Both A and D have values of 1 and 0 across the cells of the blue rectangle. Therefore, B and C are the terms that will be used to generate the product for the blue rectangle. Since both of them are a constant 0, both need to be inverted giving us $\overline{B} \cdot \overline{C}$. In the green rectangle, C takes on both values of 0 and 1 leaving A, B, and D as the constant terms across all the cells. Once again, all three are equal to the constant 0, therefore all three must be inverted giving us $\overline{A} \cdot \overline{B} \cdot \overline{D}$. The red rectangle has B dropping out leaving A, C, and D as constant 1's. This produces the product $A \cdot C \cdot D$. These three terms give us the minimum SOP expression:

$$\boxed{\overline{B} \cdot \overline{C} + \overline{A} \cdot \overline{B} \cdot \overline{D} + A \cdot C \cdot D}$$