Lab 8

Counter

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1. To flip D, we have to Increment by 1.
    - Load = 0 AND Count = 1 AND Inc2 = 0 AND Inc4 = 0 AND Inc8 = 0

2. To flip B, we have to Increment by 4.
    - (Load = 0 AND Count = 1 AND Inc2 = X AND Inc4 = 1 AND Inc8 = 0) **OR**
    - (bit C is going to be flipped from 1 to 0).

3. To flip A, we have to Increment by 8.
    - (Load = 0 AND Count = 1 AND Inc2 = X AND Inc4 = X AND Inc8 = 1) **OR**
    - (bit B is going to be flipped from 1 to 0).

4. Modifications:
    - Because **Increment by 1** flips the D bit, we need to add 1 to that bit. But firstly, we have to ensure that the value of Count is 1, while Inc8, Inc4, and Inc2 is 0. We can do that by using an AND gate consisting of Count, Inc2, Inc4, Inc8 (where the input for Inc2, Inc4, Inc8 is inverted). Then we XOR its output with the current state of D bit.
    - Because **Increment by 2** flips the C bit, we need to add 1 to that bit. But firstly, we have to ensure that the value of Inc2 and Count is 1, while Inc8 and Inc4 is 0. We can do that by using an AND gate consisting of Count, Inc2, Inc4, Inc8 (where the input for Inc4 and Inc8 is inverted). Then, we OR it with the carry out of the previous bit. Lastly, we XOR the previous OR gate's output with the current state of C bit.
    - Because **Increment by 4** flips the B bit, we need to add 1 to that bit. But firstly, we have to ensure that the value of Inc4 and Count is 1, while Inc8 is 0. We can do that by using an AND gate consisting of Count, Inc4, Inc8 (where the input for Inc8 is inverted). Then, we OR it with the carry out of the previous bit. Lastly, we XOR the previous OR gate's output with the current state of B bit.
    - Because **Increment by 8** flips the A bit, we need to add 1 to that bit. But firstly, we have to ensure that the value of Inc8 and Count is 1. We can do that by using an AND gate consisting of Count and Inc8. Then, we OR it with the carry out of the previous bit. Lastly, we XOR the previous OR gate's output with the current state of A bit.