Roll - 200050006

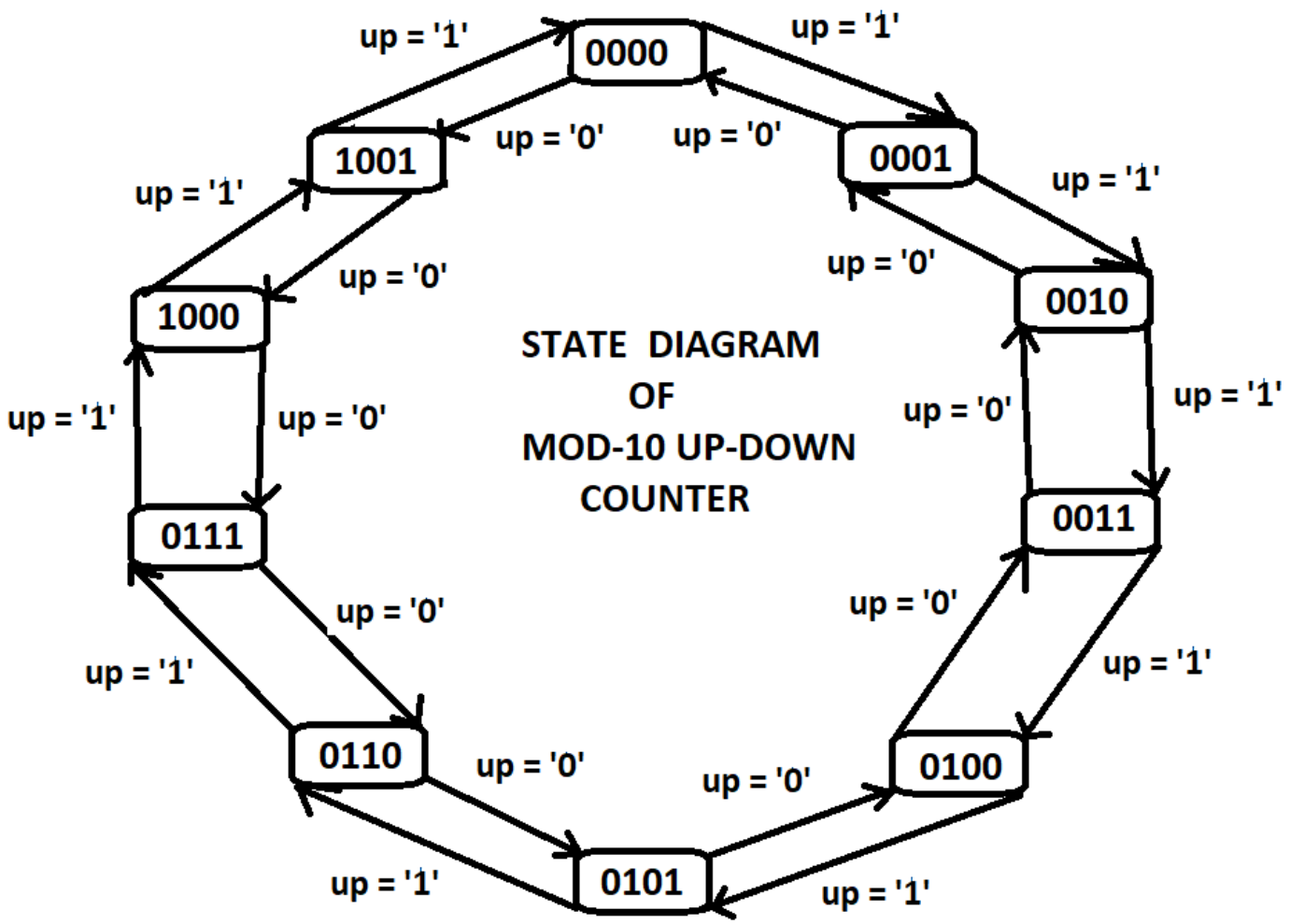
Ques - 1:

In this question, we were asked to design a mod-10 up-down counter. As long as ‘up’=1, the value of ‘count’ should increase by ‘1’ every clock cycle. As long as ‘up’=0, the value of ‘count’ should decrease by ‘1’ every clock cycle. ‘clk’ is the input clock signal and ‘rst’ the reset signal input.

The mod-10 means that the value of count can range from 0 to 9.
After 0 , decrementing the counter by 1 will result in 9 and after 9, incrementing the counter by 1 will result in 0.

If the value of the reset pin is 1, then we initialize the counter to 0000 and if the reset is 0, then we will manipulate the value already present in counter i.e increment the counter by 1 if the value of up = ‘1’ and decrement the counter by 1 if the value of up = ‘0’.

State Diagram :



Logic Used in Code:
First I have checked if the reset pin is 1, then I initialized the counter to 0, else used the current value of counter to perform further calculations.

In else part, if the reset pin is 0, I checked for the value of up pin. If the value of up = ‘1’, then I will again check for a condition if the value of count is 9(1001) then instead of adding 1 , I will update the value of counter to 0(0000) else for all other values of count, I will increment the value of counter by 1.

Similarly if the value of up=’0’, I will again similarly check if the value of count is 0(0000), then instead of decrementing the value by 1, I will update the value of count to 9(1001) and for all other values of count, I will decrement the value of count by 1.

This is the summary of the simple logic that I have used in my code.