(30 pts)
1) Consider the following addition on two 2’s Complement Binary numbers:

\[
\begin{array}{cccc}
1 & 0 & 0 & 1 \\
+ & 1 & 0 & 0 \\
\hline \\
& & 1 & 0 & 0 & 1 \\
\end{array}
\]

Without using a calculator, perform the 2’s Complement Binary addition, as shown in class. Make observations on the overflow.

Then, convert the result to a decimal number as shown in class. Finally, show the result in Hexadecimal coding as done in class.

(20 pts)
2) Consider the following gate network:

Obtain the corresponding truth table.

In order to solve the problem, first label the output of each AND gate as to which input combination it detects. Then, obtain the truth table.
(20 pts)
3) Compute the following:

\[ [(10001) \text{ OR (01000)}] \text{ NAND [NOT (10100)]} \]

Make sure to show all the intermediate steps.

(30 pts)
4) Consider the following black-box view of a vending machine controller:

Obtain the finite state diagram of the vending machine controller as shown in class.

The vending machine delivers soda and chips, hence the outputs DS (Deliver Soda) and DC (Deliver Chips).

Each costs only **25 cents**.

When you obtain the state diagram assume that the user **always** inputs 25 cents. That is, the user **never** exceeds 25 cents. Therefore, there is **no** change returned.

This means that the user does **not** input coins in such orders as a quarter followed by a quarter (50 cents), or one nickel and then a quarter (30 cents), etc.

After 25 cents is input, the user makes a choice and the vending machine delivers the soda or chips.

Make sure that you share the states to reduce the number of states.

Is there a reset state? Why?