1) Consider the following number in binary. Calculate the decimal number based on the given formats:

$$(1010011)_2 = (?)_{10}$$

a. Sign-Magnitude

b. Unsigned

c. 1's Complement

d. 2's Complement

2) Consider the following Boolean expression:

$$F = \overline{\overline{a} + d} \cdot \overline{b + \overline{c}} \cdot \overline{\overline{c} + d}$$

a. Simplify the expression.

b. Construct a gate level of the simplified function.

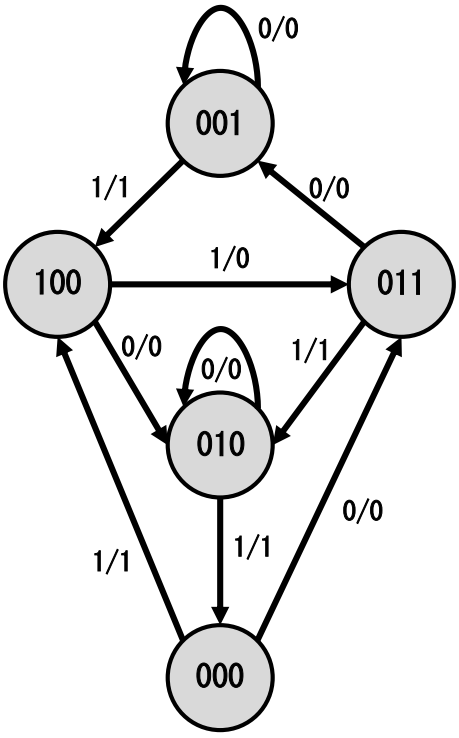
c. Construct a gate level of the same function only using NAND gates.

3) The state diagram of a Finite State Machine (FSM) is given below:

a. Determine this machine's type. (Whether the following machine is a Mealy State Machine or Moor State Machine)

b. Based on your answer in the previous section, convert the machine to other type.

c. Construct the state transition table for the original machine.



4) Design a circuit that computes the cube of the input (2 bits), using the minimum size possible ROM.

5) Design a circuit with the following conditions:

- Input: 4-bit number A ($A_3A_2A_1A_0$)
- Output: Output goes HIGH if A is a multiplier of 2 or 3.
- Using only 8:1 Multiplexer.

6 – Bonus point) Using shift registers, Flip-Flops and logic gates design a circuit that computes the 2'complement of a serial input.

If you have any questions regarding this assignment, feel free to contact us.

Please submit your homework, simulations and projects in the following format:

Name_StudentNumber_HW0 (BillGates_12345678_HW0)

Good Luck!