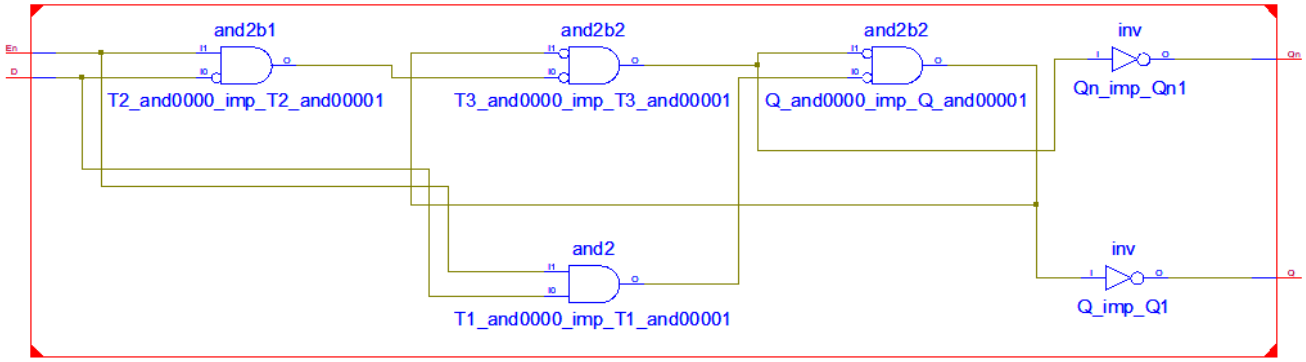
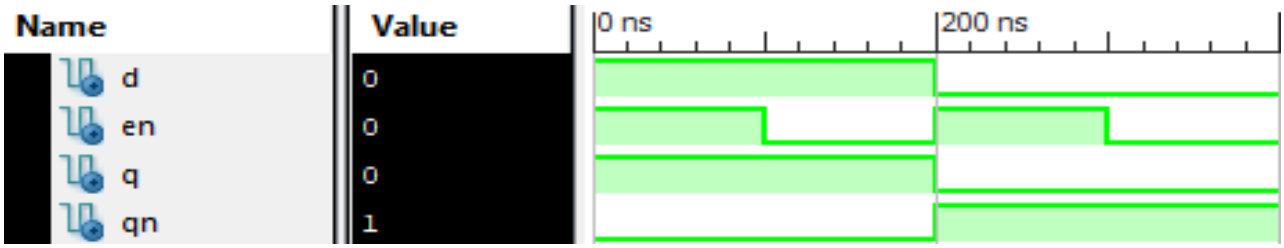
1.) D Lacth

RTL Schematic



Test Bench



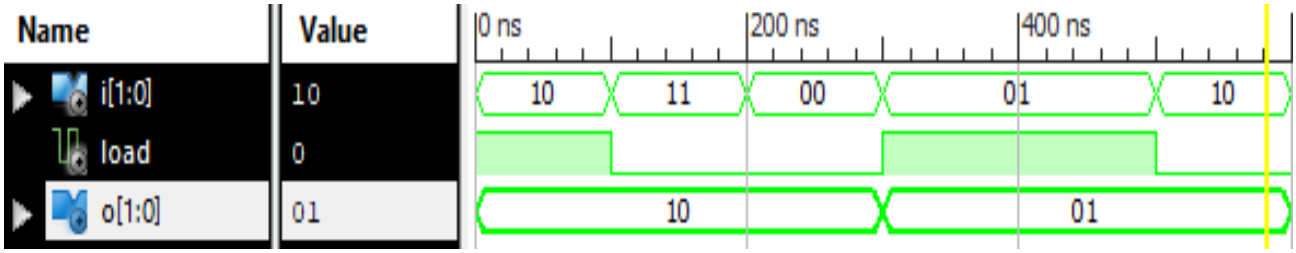
D latch is given yourself when enable is 1. If enable is 0, Q is acting like memory.

D	En	Q	Qn
1	1	1	0
1	0	1	0
0	1	0	1
0	0	0	1

2.) PIPO Register

RTL Schematic

Test Bench

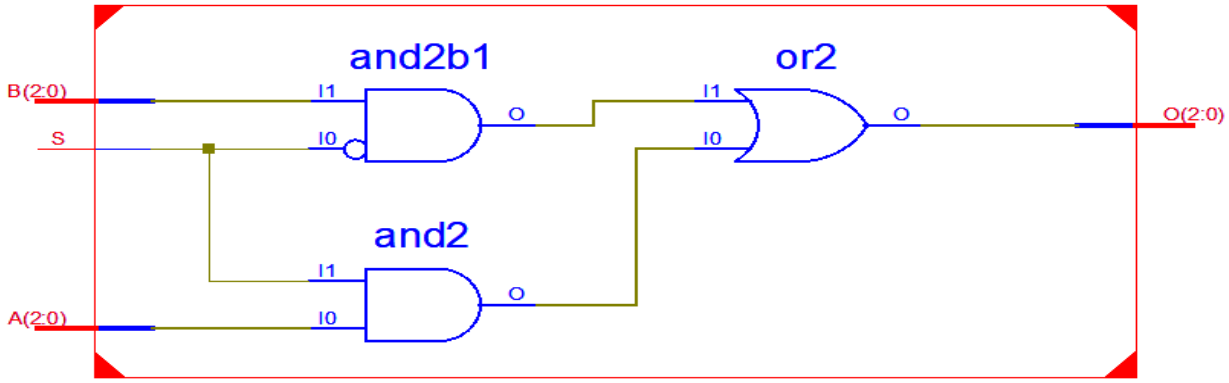


PIPO Register is acting like D latch , It is given data when load is 1. If load is 0 , output will give the before result.

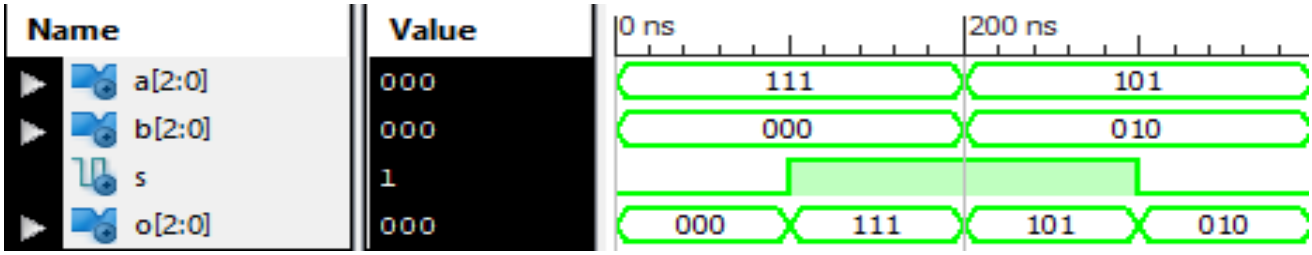
FOR Example : Our input is 10 and load is 1 , our output will be 10 . After that we change ınput and load will be 0 , our output doesn't change because when load is 0 , output shows before result.

3.) MULTİPLEXER

RTL Schematic



Test Bench



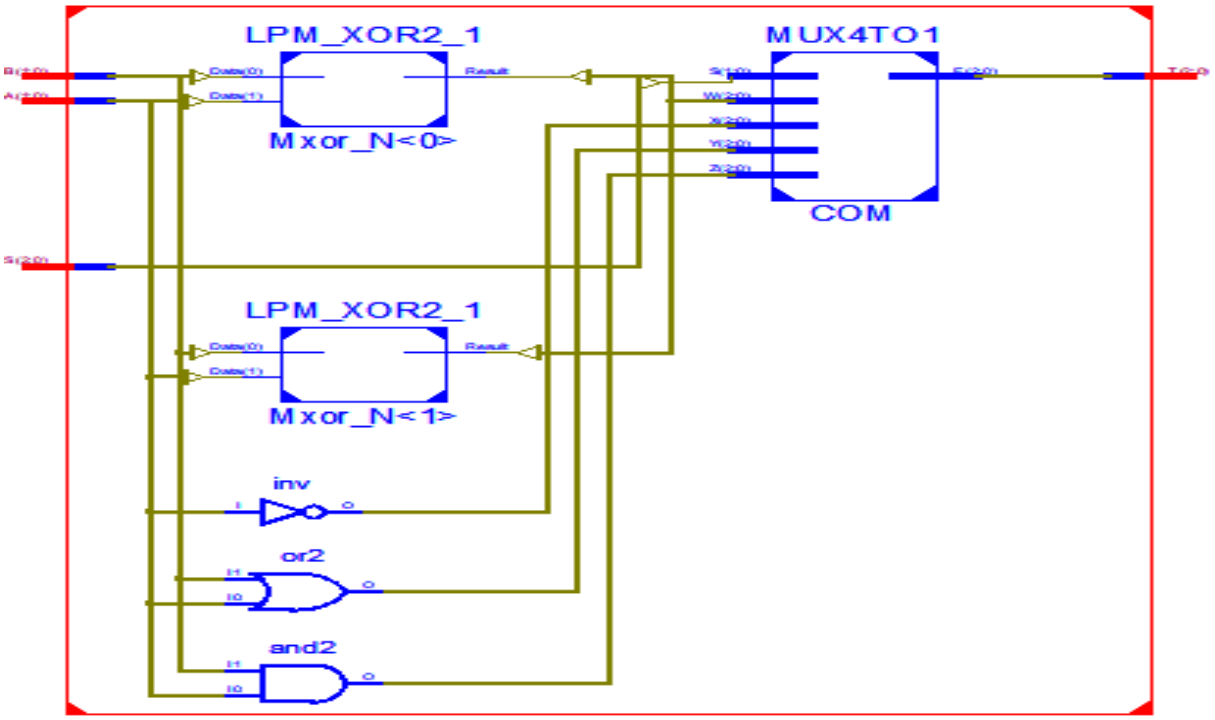
We use multiplexer to transfer the selected value.

For example : We want to see input A . If S will be 1 , we can see it .

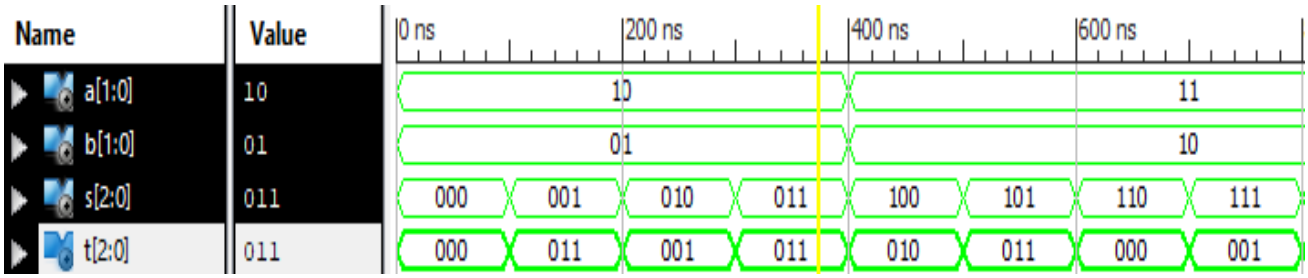
INPUTS	SELECT LİNE	OUTPUT
X	1	A
X	0	B

4.) Logic Unit

RTL Schematic



Test Bench



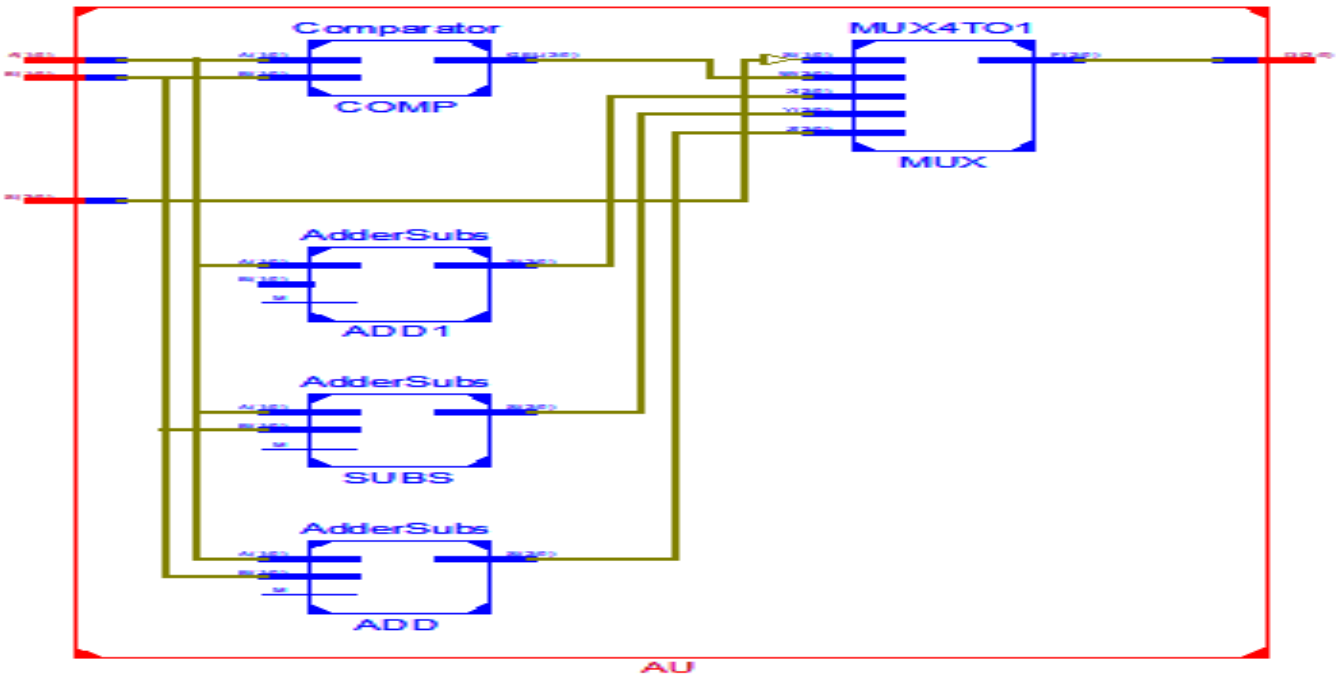
We use 4 logic operations in this test bench.

1. **When S = 000 , A and B (A(1) and B(1) = T(1) , A(0) and B(0) = T(0))**
2. **When S = 001 , A or B (A(1) or B(1) = T(1) , A(0) or B(0) = T(0))**
3. **When S = 010 , Not A**
4. **When S = 011 , A xor B (A(1) xor B(1) = T(1) , A(0) xor B(0) = T(0))**

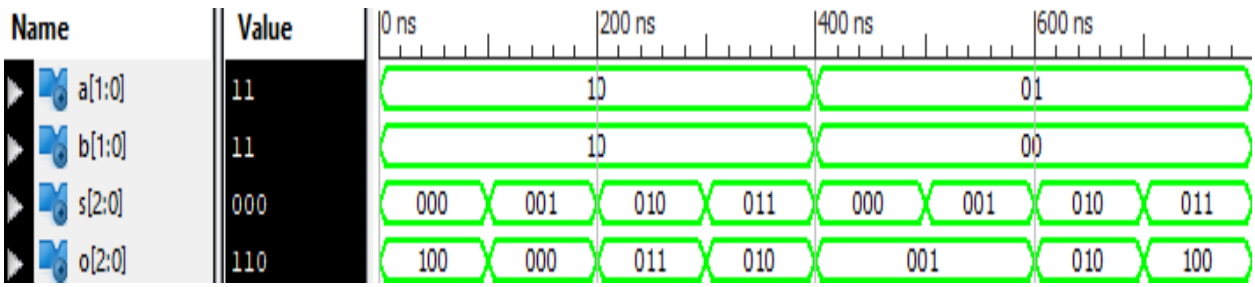
S(2) doesn't change anything.

5.) Arithmetic Unit

RTL Schematic



Test Bench

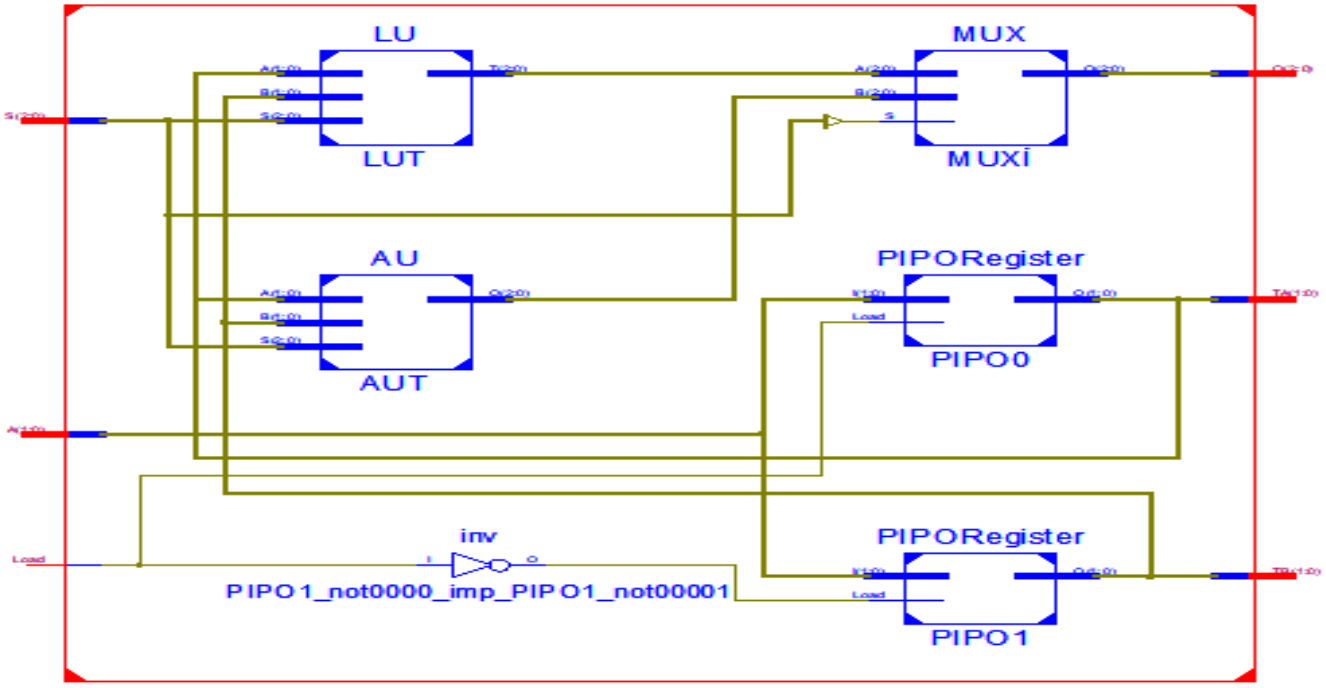


We use arithmetic operations in this test bench.

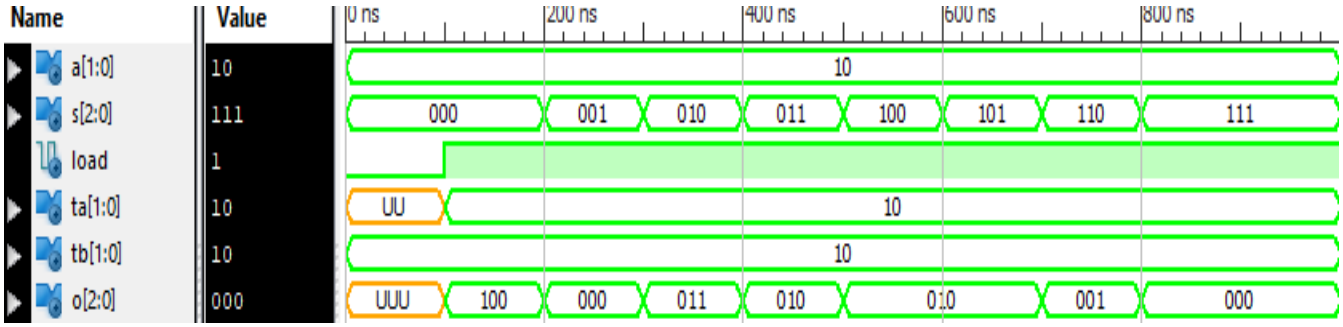
1. **When S = 000 , (A + B)**
2. **When S = 001 , (A - B)**
3. **When S = 010 , (A + 1)**
4. **When S = 011 , (A >=< B) (In comparator , I designed output like GEL so , If A <B , output is given 001 , If A = B , output is given 010 , If A > B , output is given 100.)**

6.) Arithmetic Logic Unit

RTL Schematic



Test Bench



First quadruple is for Arithmetic Operation

1.) When S = 000 (TA + TB)

2.) When S = 001 (TA - TB)

3.) When S = 010 (TA + 1)

4.) When S = 011 (TA >=< TB)

Second quadruple is for Logic Operation

5.) When S = 100 (TA and TB)

6.) When S = 101 (TA or TB)

7.) When S = 110 (Not TA)

8.) When S = 111 (TA xor TB)