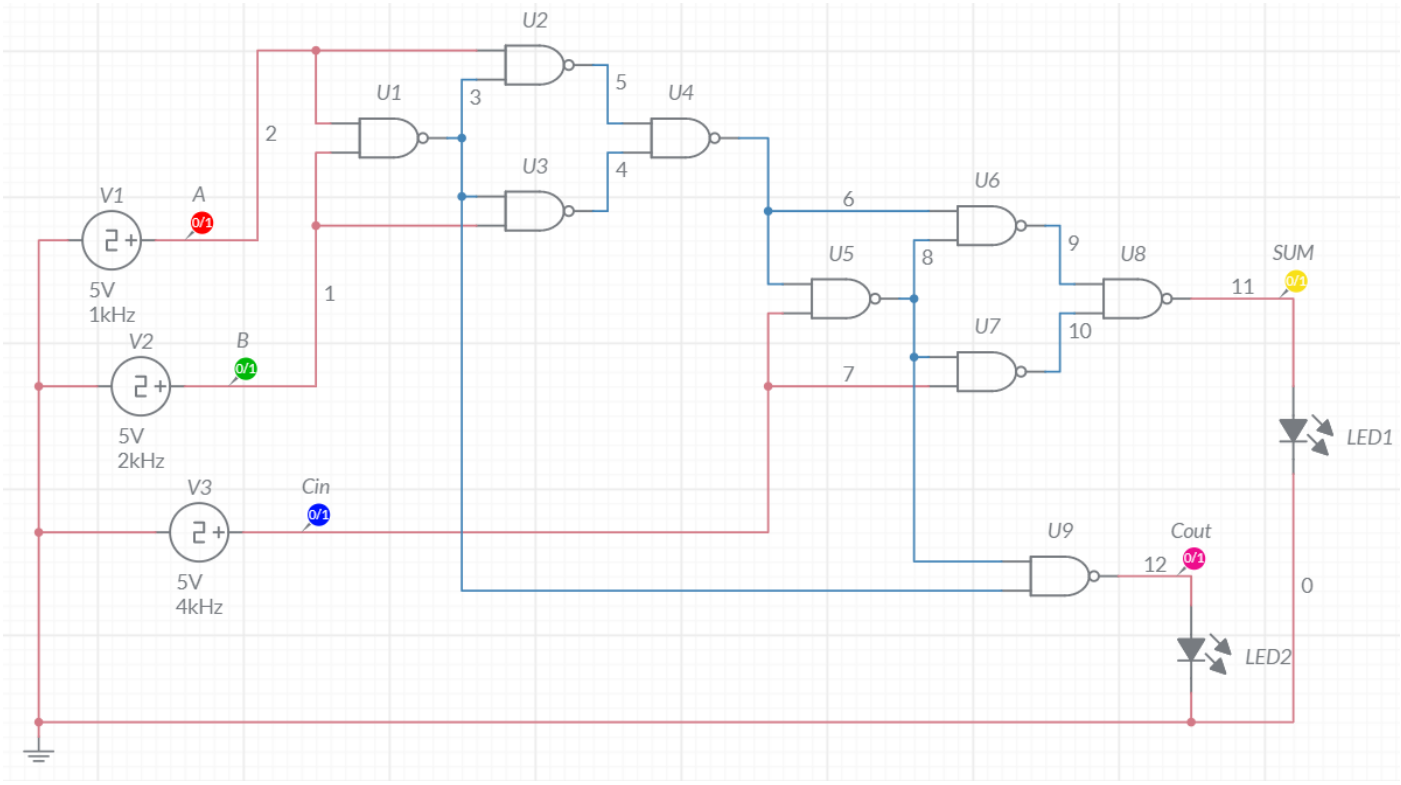
# ASSIGNMENT-4

U19CS012

**Design the below given circuits. Verify their Functionality with the help of Multisim.**

**1.** Full Adder using least number of NAND Gates.

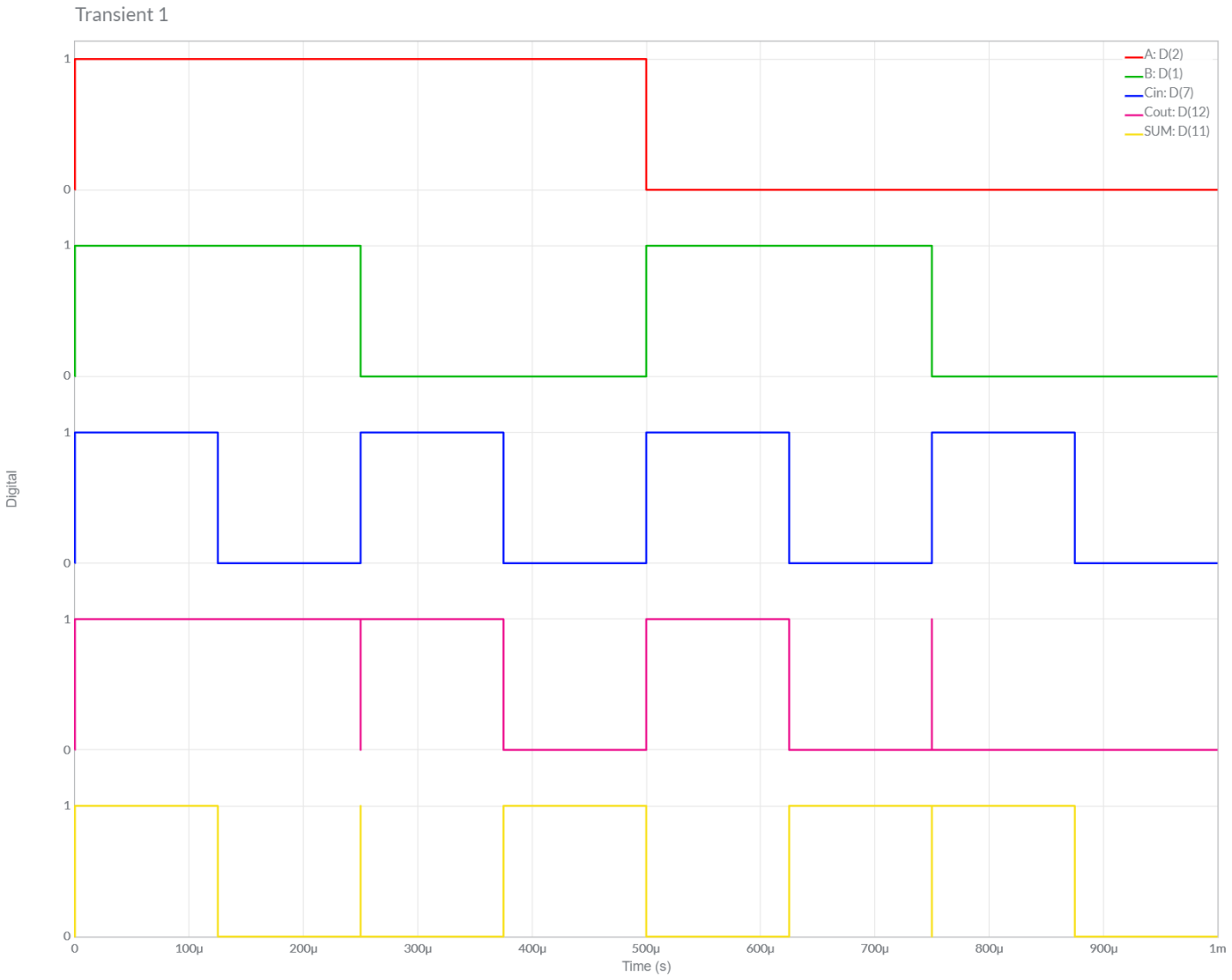
*a.) Implement the circuit in Multisim online*




b.) Truth Table

| | INPUTS | | | OUTPUTS | |
|---|---|---|---|---|---|
| | A | B | Cin | Cout | SUM |
| 1 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 1 | 0 | 1 |
| 3 | 0 | 1 | 0 | 0 | 1 |
| 4 | 0 | 1 | 1 | 1 | 0 |
| 5 | 1 | 0 | 0 | 0 | 1 |
| 6 | 1 | 0 | 1 | 1 | 0 |
| 7 | 1 | 1 | 0 | 1 | 0 |
| 8 | 1 | 1 | 1 | 1 | 1 |

## c.) Timing Graph



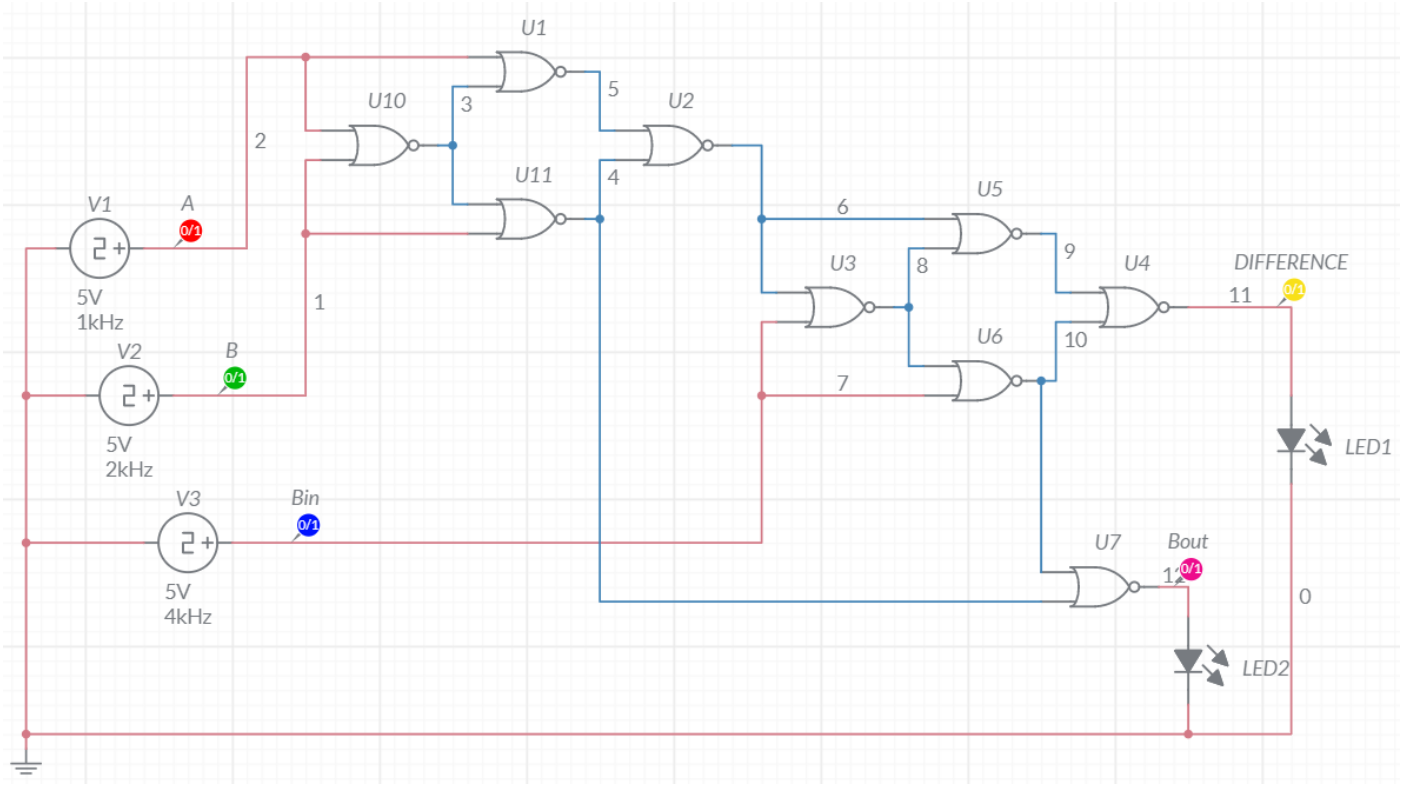

## d.) Conclusion

We can observe from Above Graph and Truth Table, Both the *Theoretical* and *Multisim* Values of Given Circuit are **Equal**.

Hence, Experiment is Performed Successfully (without any Error) & Functionality of Circuit is verified.

## 2. Full Subtractor using least number of NOR Gates.

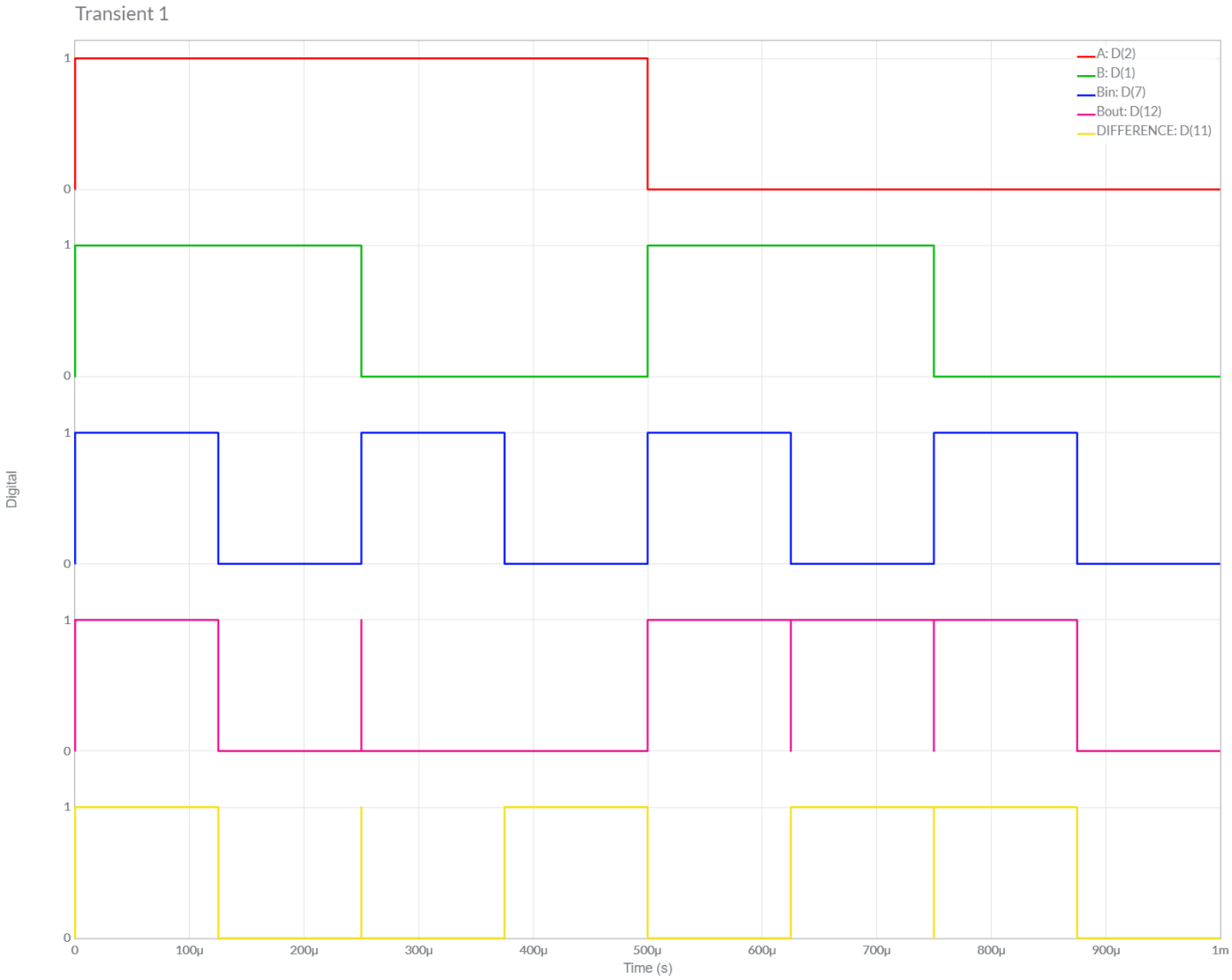
### *a.) Implement the circuit in Multisim online*




### c.) Truth Table

| | INPUTS | | | OUTPUTS | |
|---|---|---|---|---|---|
| | A | B | Bin | Bout | DIFF |
| 1 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 1 | 1 | 1 |
| 3 | 0 | 1 | 0 | 1 | 1 |
| 4 | 0 | 1 | 1 | 1 | 0 |
| 5 | 1 | 0 | 0 | 0 | 1 |
| 6 | 1 | 0 | 1 | 0 | 0 |
| 7 | 1 | 1 | 0 | 0 | 0 |
| 8 | 1 | 1 | 1 | 1 | 1 |

## b.) Timing Graph



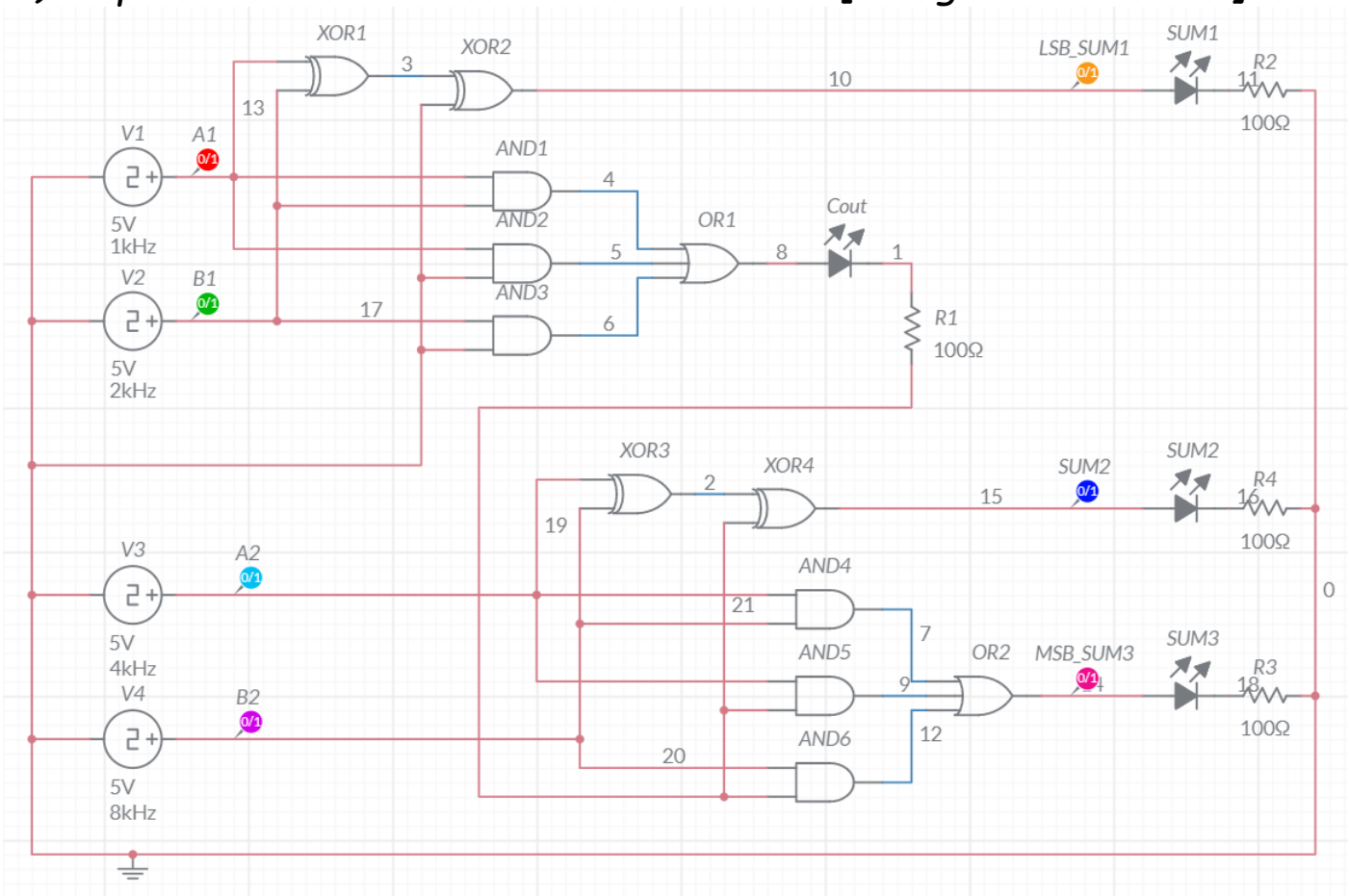

## d.) Conclusion

We can observe from Above Graph and Truth Table, Both the *Theoretical* and *Multisim* Values of Given Circuit are **Equal**.

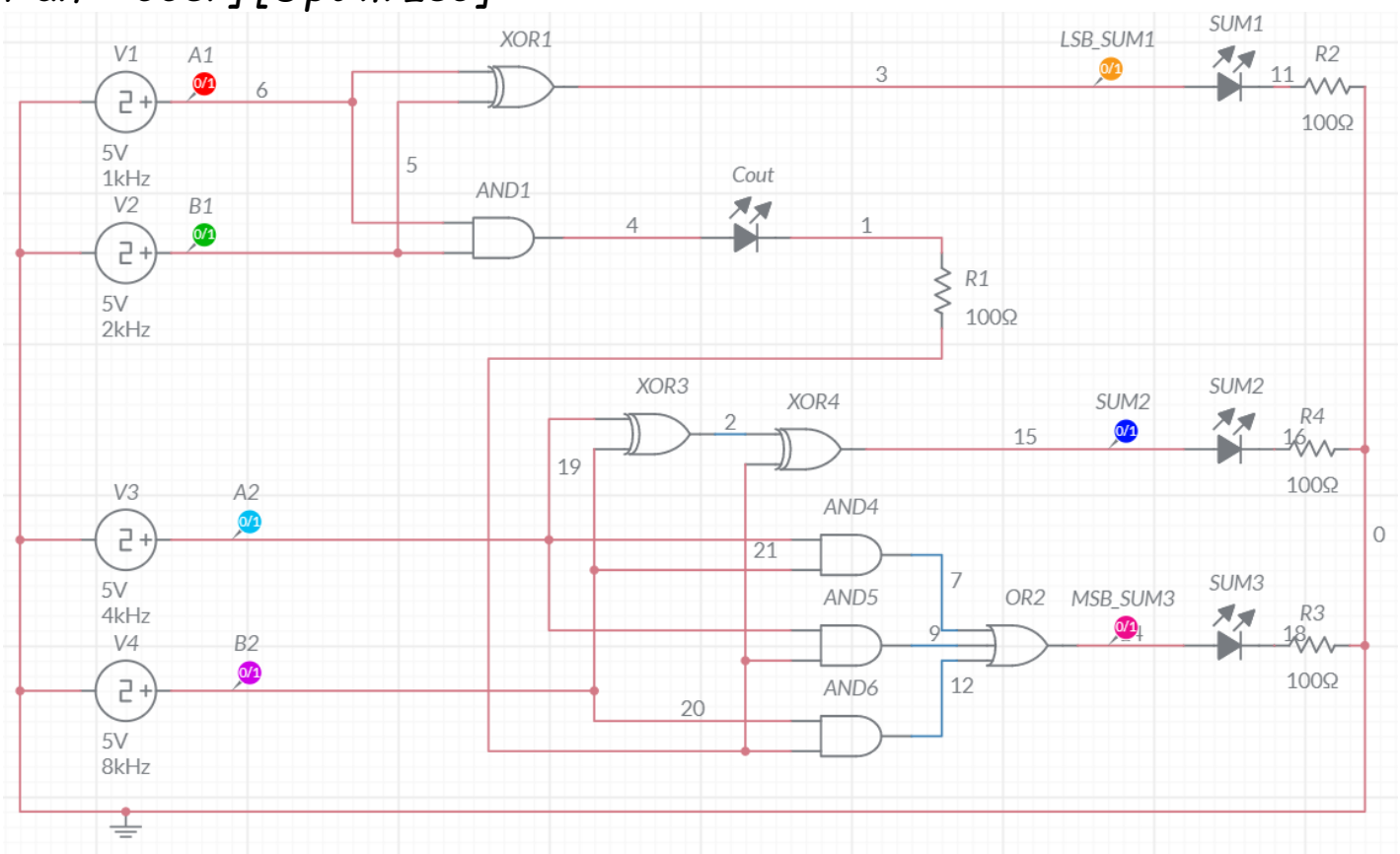
Hence, Experiment is Performed Successfully (without any Error) & Functionality of Circuit is verified.

**3.** Two bit Adder circuit using Full Adders. Attach screenshots for any four input combinations.

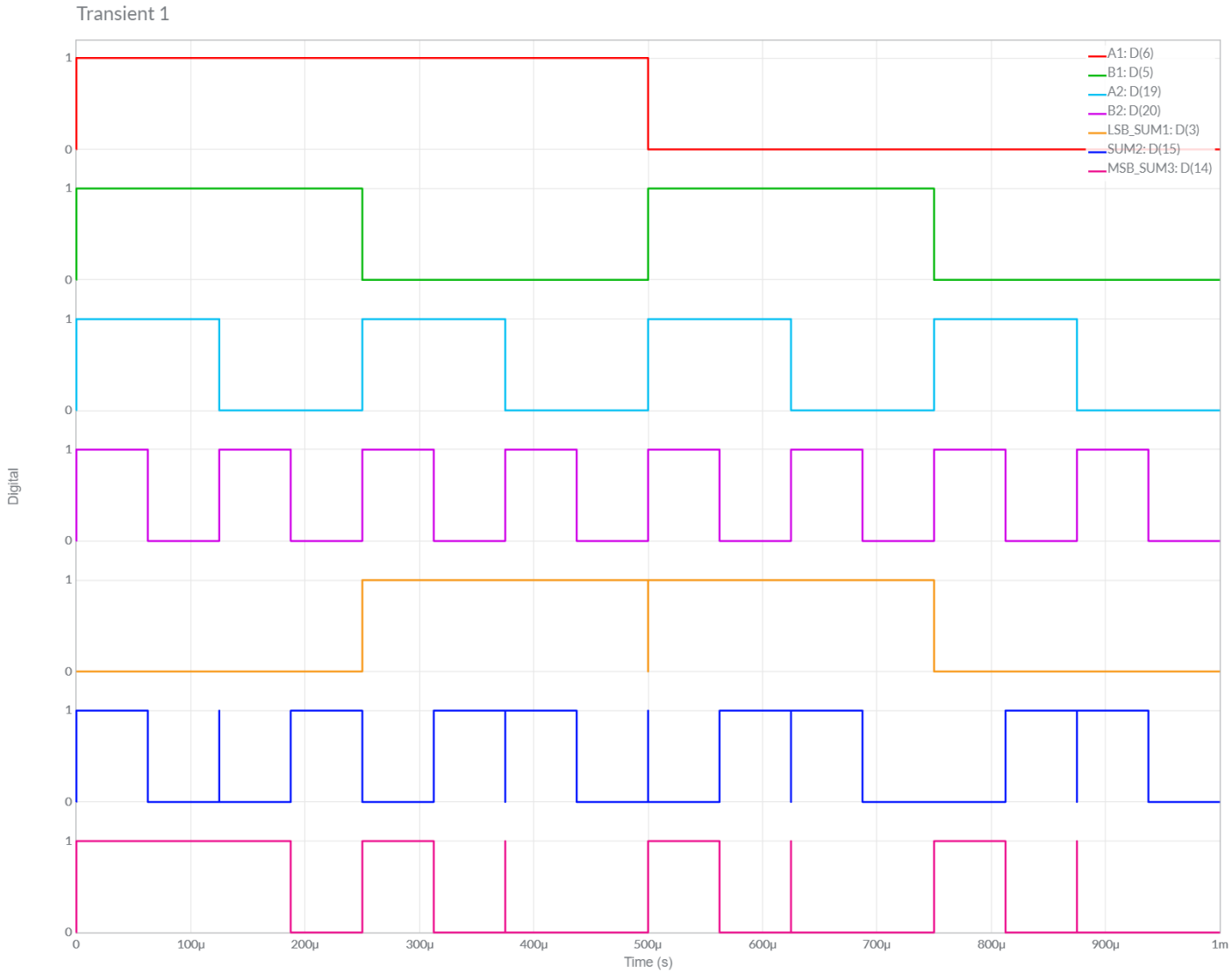
*a.) Implement the circuit in Multisim online [Using 2 Full Adders]*




*b.) Implement the circuit in Multisim online [Using 1 Full Adders + 1 Half Adder] [Optimized]*



## c.) Timing Graph [Same for Both Circuit]




## c.) Truth Table

| | INPUTS | | | | OUTPUTS | | |
|---|---|---|---|---|---|---|---|
| | A1 | B1 | A2 | B2 | LSB(SUM1) | SUM2 | MSB(SUM3) |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 3 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 4 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 5 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 6 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 7 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| 8 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| 9 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 10 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 11 | 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| 12 | 1 | 0 | 1 | 1 | 1 | 0 | 1 |
| 13 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 14 | 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| 15 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| 16 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |

## d.) Conclusion

We can observe from Above Graph and Truth Table, Both the *Theoretical* and *Multisim* Values of Given Circuit are **Equal**.

Hence, Experiment is Performed Successfully (without any Error) & Functionality of Circuit is verified.