# DIGITAL ELECTRONIC CIRCUITS LAB

# EXPERIMENT 5

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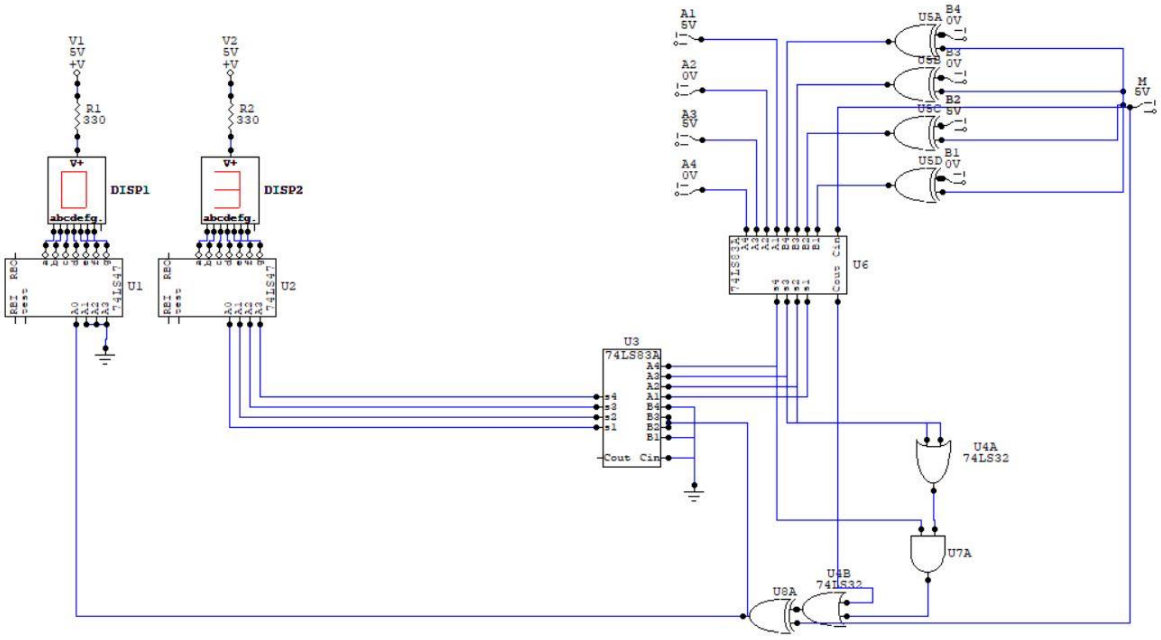
## Objective

To add and subtract two 4-bit numbers using 7483 ICs and displaying the result on two 7-segment displays.

## Circuit Diagram




## Discussion:

- In this experiment, two 4-bits integers $A$ and $B$ were to be added or subtracted depending on whether $M = 0$ or $M = 1$. In case of subtraction, it is assumed that $A \geq B$. The 4-bits integers were to be manually entered using switches.
- For addition and subtraction, two 7483 ICs were used. Adding two 4-bits integer is simple, but in order to subtract them, let's say we have to compute $A - B$. To compute this, we first complement every bit of $B$, and make it $C = \sim B$. Now, it is easy to prove that $A - B = A + C\ (+1)$.
- It is easy to do this as we can automate it by using the value of mode $M$.
- Next, we have to check whether given result is greater than 9 or not. In the former case, two 7-segment displays are required, while only one display is required for the latter case.
- Let's say after the operation, we have summand $S = s_4 s_3 s_2 s_1$ and carry out $C_{out}$. We compute $F = M \oplus (C_{out} + s_4 \cdot (s_3 + s_2))$ . If $F = 1$, we would need two displays, otherwise only one display suffices.
- Now, if $F = 1$, then we have to add 6 to summand $S$ before feeding it to 7-segement display.
- So, then basically, $S$ is connected with first 7-segment display and $F$ is connected with second 7-segment display.