DIGITAL ELECTRONIC CIRCUITS LAB

EXPERIMENT 6

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Objective

- Adding two 4-bits integers (which are input from ASCII keyboard) and display the sum output as
    - Five logic display elements
    - One logic display element and a 7-segment display

Circuit Diagram

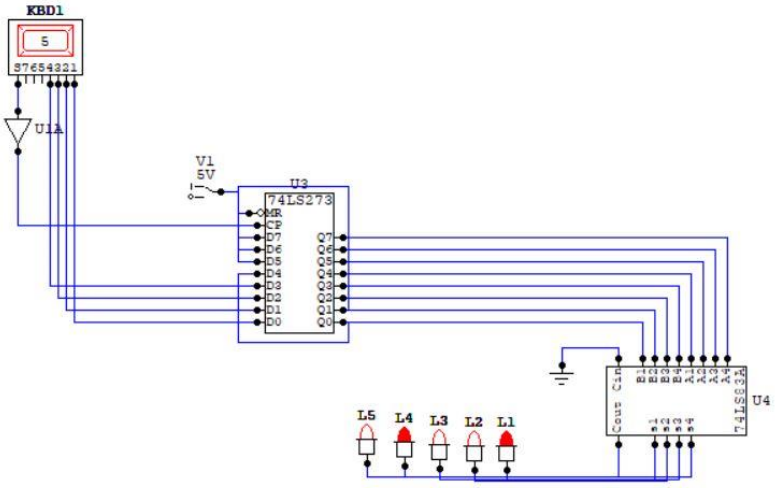

Fig 1. Circuit diagram for Part A

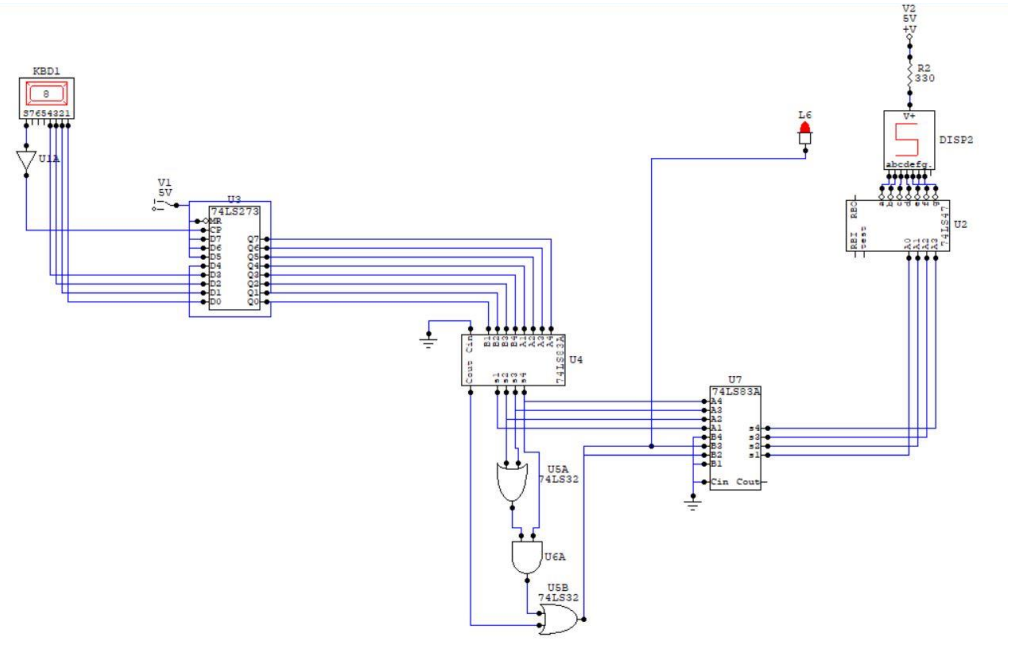

Fig 2. Circuit Diagram for Part B

Discussion

- In this experiment two 4-bits integers $A = a_4a_3a_2a_1$ and $B = b_4b_3b_2b_1$ were to be added using 7483 IC.
- For realizing the 4-bits integers, four least significant bits of ASCII keyboard was considered.
- As the ASCII keyboard can produce only one integer at a time, we needed to store the realized integer so that it can be added with next realizable integer.
- For this, we used 74273 IC which is basically an octal positive edge triggered D flip flop with active low master reset.
- We used buffer CD 4050 as in the 74273 IC, the counter pulse must arrive a few nanoseconds after the input.
- Then in the second phase, we have with ourselves the two realized integers and we have to add them.
- For this, we use 7483 IC, which is a 4-bit full adder. Let $S = A + B = s_4s_3s_2s_1$ and the carry output be c_5.
- We use logic display elements for each of the bits c_5, s_4, s_3, s_2, s_1 represented as L_5, L_4, L_3, L_2, L_1 respectively.
- In the next part of the experiment, we had to display this output as a combination of a logic element and a 7-segment display.
- For this, we compute $C_f = c_5 + s_4 \cdot (s_3 + s_2)$. The significance of the variable C_f is that if it is high then the sum is greater than 9 and will require the lamp for its representation as well. However, when C_f is low, the lamp is not required and the sum can only be represented in a 7-segment display.
- When C_f is high, we need to add 0110 to the sum to make it compatible with the 7-segment display (basically we are converting the sum into equivalent BCD format).

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