

A circuit that will be designed which is used to compare two n -bit positive integers, $A=(a_{n-1}a_{n-2}\dots a_1a_0)_2$ and $B=(b_{n-1}b_{n-2}\dots b_1b_0)_2$. The circuit has three 1-bit outputs, x,y,z . The definitions and the Boole functions of the outputs are given below.

$$A > B \rightarrow (1, 0, 0) = (x, y, z)$$

$$A < B \rightarrow (0, 1, 0) = (x, y, z)$$

$$A = B \rightarrow (0, 0, 1) = (x, y, z)$$

$$a_i > b_i \rightarrow (1, 0, 0) = (u_i, t_i, v_i)$$

$$a_i = b_i \rightarrow (0, 1, 0) = (u_i, t_i, v_i)$$

$$a_i < b_i \rightarrow (0, 0, 1) = (u_i, t_i, v_i)$$

$$x = u_{n-1} + t_{n-1}u_{n-2} + t_{n-1}t_{n-2}u_{n-3} + \dots + t_{n-1}t_{n-2}\dots t_2u_1 + t_{n-1}t_{n-2}\dots t_2t_1u_0$$

$$y = v_{n-1} + t_{n-1}v_{n-2} + t_{n-1}t_{n-2}v_{n-3} + \dots + t_{n-1}t_{n-2}\dots t_2v_1 + t_{n-1}t_{n-2}\dots t_2t_1v_0$$

$$z = t_{n-1}t_{n-2}\dots t_1t_0$$

The schematic of the basic block that will be used to design the circuit is shown in Fig. 1.

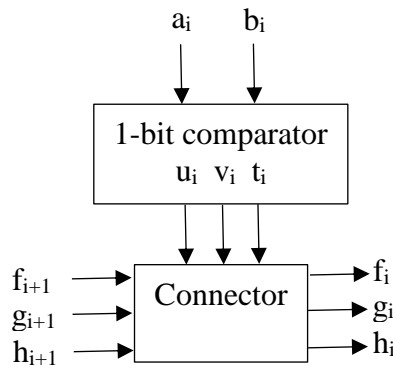


Figure 1

If the relation between the numbers represented by the bits from $(n-1)$ to i is $(a_{n-1}a_{n-2}\dots a_{i-1}a_i)_2 > (b_{n-1}b_{n-2}\dots b_{i-1}b_i)_2$ then $f_i=1$

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If the relation between the numbers represented by the bits from $(n-1)$ to i is $(a_{n-1}a_{n-2}\dots a_{i-1}a_i)_2 = (b_{n-1}b_{n-2}\dots b_{i-1}b_i)_2$ then $h_i=1$

- 1) Draw the schematic of the 1-bit comparator circuit using the logic gates.
- 2) Draw the schematic of the connector circuit using the logic gates.
- 3) Draw the schematic of the comparator circuit for two 3-bit positive numbers, $A=(a_2a_1a_0)_2$ and $B=(b_2b_1b_0)_2$, by using the circuit shown in Fig. 1 as the basic building block.