CS 232 Lab 3 Q2

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4-bit ripple carry adder(`FourbitRipCarAdd.vhd`)

I have designed the 4-bit ripple carry adder where 'a' and 'b' are the two 4-bit unsigned numbers that are to be added. 'cin' is a single-bit input carry that should be added with 'a' and 'b'. 'sum' is the 4-bit unsigned addition output and 'cout' is the single-bit output carry. It is designed only using the 1-bit full adder designed in the previous question.

The a 4-bit ripple carry adder Logical Expression is as follows,

sum(0) = Full-Adder-Sum(a(0), b(0), cin)),

sum(1) = Full-Adder-Sum(a(1), b(1), c0)),

sum(2) = Full-Adder-Sum(a(2), b(2), c1)),

sum(3) = Full-Adder-Sum(a(3), b(3), c2)),

c0 = Full-Adder-cout(a(0), b(0), cin),

c1 = Full-Adder-cout(a(1), b(1), c0),

c2 = Full-Adder-cout(a(2), b(2), c1),

cout = Full-Adder-cout(a(3), b(3), c2),

Here c0, c1, c2 are single bit signals used to store carry at each addition.

Therefore using the above shown way I created the 4-bit ripple carry adder using only the 1-bit full adder where A = a(i), B = b(i) and cin = ci.

For each bit of addition we need one 1-bit Full Adder and therefore, total FullAdders required to design the 4-bit ripple carry adder is,

Full-Adders = 4