

Digital Logic Design (Sec-H)

Playing with Signed Numbers

The process is to check whether the number is positive or negative in sign convention by looking at the sign bit (MSB).

If the number is positive, the number will be same in sign magnitude system, 1's complement system and 2's complement system.

If the number is negative, the following process has to be used for proper conversion of the number to its sign magnitude system, 1's complement and 2's complement system

1. Convert the number to its positive counterpart.
2. Find the negative of the positive number in signed magnitude system and evaluate
3. Find the negative of the positive number in 1's complement system
4. Find the negative of the positive number in 2's complement system

Let us say that we have an 8 bit signed negative number 11001010 to be evaluated in signed magnitude system, 1's complement system and 2's complement system.

- Using step-1 conversion of negative number (11001010) to its positive counterpart is (01001010). (only the sign bit has been changed from '1' to '0')
- Negative of (01001010) in sign-magnitude system is (11001010)
- Negative of (01001010) in 1's complement is (10110101)
- Evaluation of (10110101) = $(-2^7 \times 1 + 2^6 \times 0 + 2^5 \times 1 + 2^4 \times 1 + 2^3 \times 1 + 2^2 \times 1 + 2^1 \times 0 + 2^0 \times 1) + 1$
 - (always remember to add 1 to the result of evaluation of 1's complement)
- Negative of (01001010) in 2's complement is (10110110)
- Evaluation of (10110110) = $(-2^7 \times 1 + 2^6 \times 0 + 2^5 \times 1 + 2^4 \times 1 + 2^3 \times 1 + 2^2 \times 1 + 2^1 \times 1 + 2^0 \times 0)$