**Digital Electronics**

**Class 10**

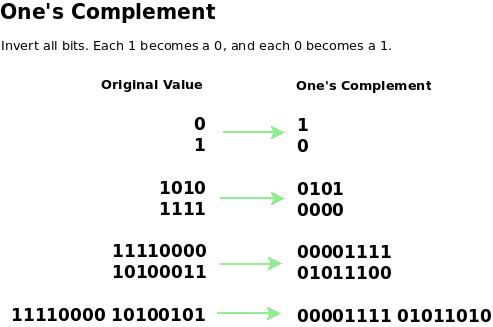
**Lab 18**

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| Lab Objectives:  * Number Complement * 1’s complement * 2’s complement |

# 

# 1’s complement

## 1’s complement of a binary number is another binary number obtained by toggling all bits in it, i.e., transforming the 0 bit to 1 and the 1 bit to 0.



Examples:

## Let numbers be stored using 4 bits

## 1's complement of 7 (0111) is 8 (1000)

## 1's complement of 12 (1100) is 3 (0011)

# 2’s complement

## 2’s complement of a binary number is 1 added to the 1’s complement of the binary number.

## IMG_256

## 

## Let numbers be stored using 4 bits

## 2's complement of 7 (0111) is 9 (1001)

## 2's complement of 12 (1100) is 4 (0100)

# Difference

## These representations are used for signed numbers.

## The main difference between 1′ s complement and 2′ s complement is that 1′ s complement has two representations of 0 (zero) – 00000000, which is positive zero (+0) and 11111111, which is negative zero (-0);

## whereas in 2′ s complement, there is only one representation for zero – 00000000 (+0) because if we add 1 to 11111111 (-1), we get 00000000 (+0) which is the same as positive zero. This is the reason why 2′ s complement is generally used.

## Another difference is that while adding numbers using 1′ s complement, we first do binary addition, then add in an end-around carry value. But, 2′ s complement has only one value for zero, and doesn’t require carry values.