Digital Electronics

Class 10

Lab 18

UNITED TRUST

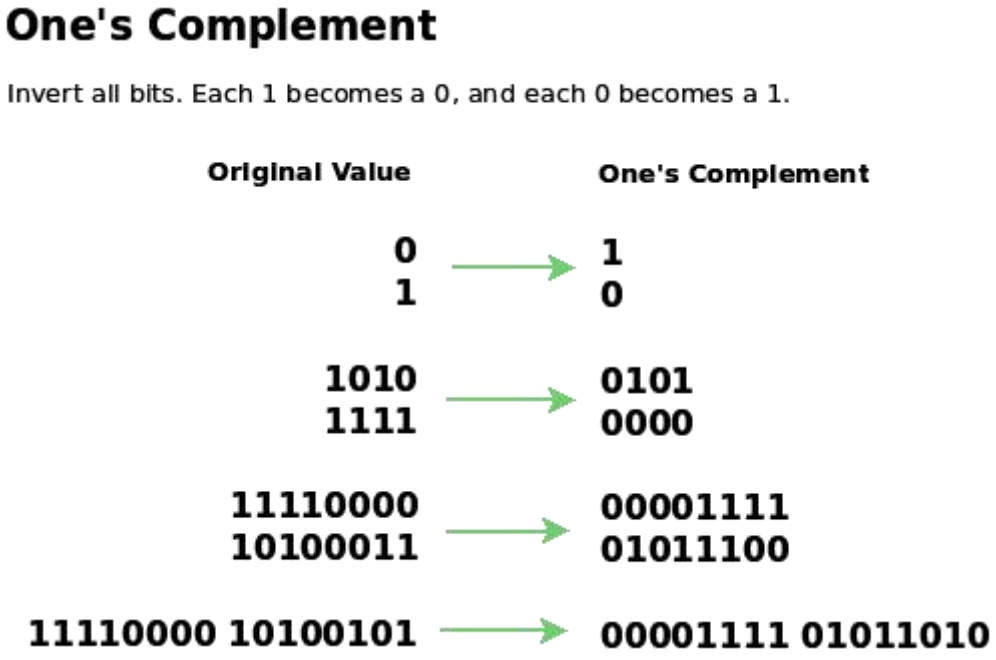
bdeducation
Bangladesh Digital Education Research Limited
সময়ের পাঠশালা

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.

Example #1

```
 5 = 00000101
     ↓↓↓↓↓↓↓↓   } Complement Digits
     11111010
           +1   } Add 1
     --------
-5 = 11111011
```

Example #2

```
-13 = 11110011
      ↓↓↓↓↓↓↓↓   } Complement Digits
      00001100
            +1   } Add 1
      --------
 13 = 00001101
```

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.