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Accredited by NAAC(Cycle-III) with 'A+' Grade  
(Recognized by UGC, Approved by AICTE, New Delhi and  
Affiliated to Bharathiar University, Coimbatore)

**DEPARTMENT OF GRAPHIC & CREATIVE DESIGN AND DATA ANALYTICS**

**COURSE NAME : COMPUTER SYSTEM ARCHITECTURE  
(23UCU402)**

**I YEAR /I SEMESTER**

**Unit I- Data Representation**

**Topic :Complements**



# Complements

- ✓ Complements are used in digital computers for facilitating the subtraction operation and for logical manipulation.
- ✓ There are two methods of complements for each base  $r$  system:
  - ✓ the  $r$ 's complement and
  - ✓ the  $(r - 1)$ 's complement.



# $(r - 1)$ 's Complement

Given a number  $N$  in base  $r$  having  $n$  digits, the  $(r^n - 1)$ 's complement of  $N$  is represented as  $(r^n - 1) - N$ .

For decimal numbers  $r = 10$  and  $r - 1 = 9$ , therefore the 9's complement of  $N$  is  $(10^n - 1) - N$ .

Now,  $10^n$  defines a number that includes a single 1 followed by  $n$  0's.

$10^n - 1$  is a number defined by  $n$  9's.

For example, : 45329

with  $n = 5$  we have  $10^5 = 100000$  and  $10^5 - 1 = 99999$ .

$$\begin{array}{r}
 9 \ 9 \ 9 \ 9 \ 9 \\
 4 \ 5 \ 3 \ 2 \ 9 \ (-) \\
 \hline
 5 \ 4 \ 6 \ 7 \ 0
 \end{array}$$

# $(r - 1)$ 's Complement

The 9's complement of 55325 is 44674.

## DESCRIPTIONS

To obtain the 9's complement of a decimal (base 10) number, we subtract each digit of the number from 9.

$$\begin{array}{r} 9 \ 9 \ 9 \ 9 \ 9 \\ 5 \ 5 \ 3 \ 2 \ 5 \ (-) \\ \hline 4 \ 4 \ 6 \ 7 \ 4 \end{array}$$

# Assessment - Questions

1. Convert 2456-1235 using 9's and 10's Complement
2. Convert 145788-1849 using 9's Complement
3. Convert 145788-1849 using 9's Complement



# References

- 1.M.Morris Mano, “Computer System Architecture” 3<sup>rd</sup> Edition, Prentice Hall of India ,2000, ISBN-10: 0131663631
2. V.K. Puri, –DIGITAL ELECTRONICS CIRCUITS AND SYSTEMS” McGraw Hill Education (1 July 2017). ISBN-10: 9780074633175 , ISBN-13: 978-0074633175
- 3.William Stallings, “Computer Organization and Architecture, Designing for Performance” PHI/ Pearson Education North Asia Ltd., 10th Edition 2016, ISBN 978-0-13-410161-3 — ISBN 0-13-410161-8.

## Thank You