(r-1)'s Complements

Given positive number N in base r having integer part of 'n' digits and fractional part of 'm' digits Then (r-1)'s Complement of 'N' is

$(r^n - r^{-m} - N)$

$N = (7)_{10}$
$r = 10$
$n = 1$
$m = 0$

$(7)_{10}$

$(r-1)'s \Rightarrow (10-1)'s$
$\Rightarrow 9's$

$(7)_{10}$, determine its 9's Complement

$= (r^n - r^{-m} - N)$

$= (10^1 - r^{-0} - 7)$

$= \underbrace{10 - 1}_{9} - 7 \Rightarrow 9 - 7 \Rightarrow (2)_{10}$

$r = 10$
$n = 1$
$m = 0$
$N = 7$

Direct method (9's Complement)

$$\begin{array}{r} 9 \\ -7 \\ \hline 2 \\ \hline \end{array}$$

$(25)_{10}$ in to 9's Complement

$$\begin{array}{r} 99 \\ 25 \\ \hline 74 \\ \hline \end{array}$$

9's Complement of $(7)_{10} = 2$

$[(10-1)-7] = 9 - 7 = 2$

$(73)_{10}$ represent it in 9's Complement

$(73)_{10}$ represent it in 9's Comp -

$$10^{2} - 10^{-0} - (73)_{10} \Rightarrow (100 - 1) - 73 = 26$$

$$99 - 73 = 26$$

$(853)_{10}$ represent it in 9's Complement

$$10^{3} - 10^{-0} - \underset{(N)}{853} \Rightarrow (1000 - 1) - 853 = 146$$

$$999 - 853 = 146$$

$$\begin{array}{r} 999 \\ 853 \\ \hline \end{array}$$

> 9's Complement of number can be obtained by subtracting each digit from 9

octal (Base = 8)

(r-1)'s Complement = 7's Complement

$(26)_8$ in 7's Complement

$n = 2$
$N = 26$
$m = 0$
$r = 8$

$\boxed{r^{n} - r^{-m} - N} \Rightarrow 8^{2} - 8^{-0} - (26)_8$

$\Rightarrow (64)_{10} - 1 - (22)_{10}$

$\Rightarrow 64 - 23 \Rightarrow (41)_{10}$

$(26)_8 = (22)_{10}$

$(41)_{10} = (51)_8$

octal (Direct method)

$(26)_8$, determine its 7's Complement.

$(26)_8$, determine its 7's Complement.

$$\begin{array}{r} 77 \\ -\,26 \\ \hline (51)_8 \\ \hline \end{array}$$

$$\boxed{77 - 26 = (51)_8}$$

$(A)_{16}$ represen in $=(5)_{16}$

$$\begin{array}{r} 15 \\ A \quad 10 \\ \hline 5 \\ \hline \end{array}$$

Binary $(r=2)$

$(r-1)$'s Complement = 1's Complement

$(100)_2$

$r^n - r^{-m} - N$

$(100)_2 = (4)_{10}$

$(100)_2$
$1's\ (0\ 1\ 1)_2$

$= 2^3 - 2^{-0} - (100)_2$

$= (8)_{10} - 1 - (4)_{10} \Rightarrow 8-5 = (3)_{10}$

$= (3)_{10} \Rightarrow (011)_2$

1's Complement of $(100)_2$ as $(011)_2$

1's Complement :- For the given binary number replace 1's by zero and 0's by 1's

100
$(011)_2 \rightarrow$ 1's complement

(110) in 1's Complement
$\underset{0\,0\,1}{\downarrow\downarrow\downarrow}{}_2$

$$\boxed{\begin{array}{l} r^n - r^{-m} - N \\ 2^3 - 2^{-0} - (110)_2 \end{array}}$$

$(8)_{10} - 1 - (6) \Rightarrow 8-7 = (1)_{10}$

$(1)_{10} = (001)_2$

$(110)_2$ 1's complement number as $(001)_2$

$(\underbrace{110}_{n=3}.\underbrace{1}_{m=1})_2$ in 1's Complement $= (001.0)_2$

$r^n - r^{-m} - N$

$2^3 - 2^{-1} - (110.1)_2$ ✓ $\quad (6.5)$

$(8)_{10} - \left(\frac{1}{2}\right)_{10} - (6.5)_{10} \Rightarrow (\underset{\downarrow}{\_\_\_\_})_{10}$

Binary

$= (001.0)_2$ ✓

lement

$(7A8)_{16}$ in 15's Comp -

$n = 3 \quad 16^3 - 16^{-0} - (7A8)_{16}$

$(\quad)_{10} - (1)_{10} - (\quad)_{10} = (\quad)_{10}$

Hexadecimal

Second

15	15	15
7	A	8
8	5	7

$(857)_{16}$

$(1101)_2$ binary

$\downarrow\downarrow\downarrow\downarrow$

(0010) 1's

$(1101101)_2$

$\downarrow\downarrow\downarrow\downarrow\downarrow\downarrow\downarrow$

1's $\rightarrow (0010010)_2$

1's complement can be obtained by replacing 1's by 0's and 0's by 1's

$(2.67)_{10}$ represent it in 9's complement

$$\begin{array}{r} 9.99 \\ -\ 2.67 \\ \hline 7.32 \\ \hline \end{array}$$ ✓