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Systems\_Programming: **Homework\_2**

*Example1)*

Ex1) C=85

$$\begin{array}{r} 35 \\ \times 2 \\ \hline 15 \\ + 14 \\ \hline 10 \end{array} \quad \begin{array}{r} 12 \\ 14 \\ \times 2 \\ \hline 12 \\ 12 \\ \hline 0 \end{array}$$

Ans1) 1000 11

Ex2) d = G  
ASCII value = 71

$$\begin{array}{r} 71 \\ \times 2 \\ \hline 15 \\ + 14 \\ \hline 10 \end{array} \quad \begin{array}{r} 12 \\ 17 \\ 35 \\ \times 2 \\ \hline 12 \\ 12 \\ \hline 0 \end{array}$$

Ans2) 1000 111

Ex3) int x = -42

$$\begin{array}{r} 42 \\ \times 4 \\ \hline 16 \\ + 12 \\ \hline 0 \end{array} \quad \begin{array}{r} 12 \\ 21 \\ 40 \\ \times 2 \\ \hline 12 \\ 12 \\ \hline 0 \end{array}$$

binary = 101010 (decimal)

Adding 26 zeros on left hand side  
of this number to make this of length 32

So, normal binary = 00000000000000000000000000101010

Converting to 2's complement: 11111111111111111111111111111110101010

Ex4) float - f = 14.25

convert decimal  $\rightarrow$  factorial to binary

$$\begin{array}{r} 14 \\ \times 2 \\ \hline 8 \\ + 6 \\ \hline 0 \end{array} \quad \begin{array}{r} 12 \\ 12 \\ 6 \\ \times 2 \\ \hline 12 \\ 12 \\ \hline 0 \end{array}$$

10001

$0,25 \times 2 = 0,5 < 1$  then add 0

$0,5 \times 2 = 1 \geq 1$  then add 1

0.25 of decimal = .01 in binary

17.25 in binary is = 10001.01 (simple)

(normal binary)  $17.25 = 10001.01 \Rightarrow 1.000101 \cdot 2^4$

Single precision:

sign bit is 0 (positive)

exponent bits are  $(124 + 4 = 132) \rightarrow 100000_{11}$

$$\begin{array}{r} 132 \\ 12 ) 2 \\ 6 \quad 12 \\ 6 \quad 32 \quad 12 \\ 12 \quad 16 \quad 12 \\ 10 \quad 8 \quad 12 \\ 4 \quad 8 \quad 12 \\ 1 \quad 0 \quad 12 \\ \underline{1} \quad \underline{0} \quad \underline{0} \\ 0 \quad 0 \quad 0 \end{array}$$

132 decimal

100000<sub>11</sub> in binary

Frac/significant bits = 000101000000000000000000

So, 17.25 in single-precision format = 01000011000101000000000000000000

Exs

$$\begin{array}{r}
 1099653008 \\
 \underline{\times} \quad \frac{12}{549826504} \\
 \hline
 \begin{array}{r}
 10 \\
 6 \\
 8 \\
 \hline
 19 \\
 18 \\
 \hline
 36 \\
 16 \\
 05 \\
 \hline
 13 \\
 12 \\
 \hline
 13 \\
 12 \\
 \hline
 08 \\
 0 \\
 \end{array}
 \begin{array}{r}
 4 \\
 14 \\
 14 \\
 05 \\
 8 \\
 \hline
 38 \\
 18 \\
 02 \\
 2 \\
 \hline
 6 \\
 24 \\
 14 \\
 09 \\
 8 \\
 \hline
 6 \\
 10 \\
 05 \\
 04 \\
 4 \\
 \hline
 12 \\
 12 \\
 12 \\
 05 \\
 0 \\
 \end{array}
 \begin{array}{r}
 274913252 \\
 2 \\
 0 \\
 6 \\
 6 \\
 0 \\
 \hline
 12 \\
 12 \\
 12 \\
 14 \\
 16 \\
 16 \\
 14 \\
 14 \\
 0 \\
 \hline
 05 \\
 0 \\
 0 \\
 0 \\
 0 \\
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 214775912 \\
 \times 107384912 \\
 \hline
 14 & 10 & 53 & 69 & 39 & 12 \\
 14 & 10 & 53 & 69 & 39 & 12 \\
 \hline
 04 & 6 & 13 & 26846912 \\
 6 & 6 & 13 & 13423412 \\
 \hline
 17 & 12 & 12 & 12 & 12 & 12 \\
 16 & 12 & 16 & 16 & 16 & 16 \\
 \hline
 18 & 18 & 9 & 8 & 9 & 14 \\
 14 & 18 & 16 & 8 & 14 & 14 \\
 \hline
 10 & 6 & 3 & 3 & 2 & 6 \\
 18 & 7 & 8 & 8 & 2 & 6 \\
 \hline
 1 & 6 & 13 & 12 & 6 & 10 \\
 & 6 & 13 & 13 & 6 & 11 \\
 & 1 & 18 & 18 & 0 & 10 \\
 & & 1 & 18 & 14 & 1 \\
 & & & 1 & 14 & 1 \\
 & & & & 0 & 1 \\
 \hline
 & & & & & 1
 \end{array}$$

1000000011000101101111110010000

$$\begin{array}{r}
 \frac{2}{3} \overline{)68428313} \quad \boxed{12} \\
 \frac{3}{3} \overline{)364156} \quad \boxed{12} \\
 \frac{2}{2} \overline{)16} \quad \frac{16}{16} \overline{)2078} \quad \boxed{12} \\
 \frac{14}{14} \overline{)11} \quad \frac{10}{10} \overline{)58} \\
 \frac{6}{6} \overline{)18} \quad \frac{4}{4} \overline{)18} \\
 \frac{8}{8} \overline{)0} \quad \frac{2}{2} \overline{)0} \\
 \frac{4}{4} \overline{)0} \\
 \frac{6}{6} \overline{)0} \\
 \frac{12}{12} \overline{)0} \\
 \frac{8}{8} \overline{)0} \\
 \frac{10}{10} \overline{)0} \\
 \frac{3}{3} \overline{)0} \\
 \frac{2}{2} \overline{)0} \\
 \frac{15}{15} \overline{)0} \\
 \frac{14}{14} \overline{)0} \\
 \frac{16}{16} \overline{)0} \\
 \frac{16}{16} \overline{)0} \\
 \frac{1}{1} \overline{)0} \\
 \end{array}$$

109 ~

Ex6) Everything same as Ex4, until:

$$17,25 \text{ in normal binary} \Rightarrow 1,000101.2^4$$

64 bit :) sign bit. is odd (+ve)

Exponent bits are  $(1023 + 4 = 1027) = 10000000011$

so part of decimal is 100000000 in binary

14, 15 in 64 bit format.

## *Example2)*

	$i=0$	$i=1$	$i=2$	$i=3$
$d$	0.0	5.0	22.0	36.0

s	f	r	o	g
0	1	2	3	

$$i=0 \rightarrow d = d + (\text{double}) (s[i] - a)$$

$$= d + (\text{double}) (f - a)$$

$$= d + (\text{double}) (102 - 97)$$

$$d = 5.0$$

$$i=1 \rightarrow d = d + (\text{double}) (s[i] - a)$$

$$= 5.0 + (\text{double}) (r - a)$$

$$= 5.0 + (\text{double}) (14 - 97)$$

$$= 5.0 + 14.0$$

$$= 22.00$$

$$i=2 \rightarrow d = d + (\text{double}) (s[2] - a)$$

$$= 22.0 + (\text{double}) (11 - 97)$$

$$d = 36.0$$

$$i=3 \rightarrow d = d + (\text{double}) (g - a)$$

$$= 36.0 + (\text{double}) (103 - 97)$$

$$= 36.0 + 6.0$$

$$d = 42.00$$