UNIVERSITY OF CALIFORNIA, RIVERSIDE

Department of Computer Science and Engineering

CS61 – Machine Organization and Assembly Language

Homework 1

Given August 1, Due August 7, 2001

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1. How many bytes are needed to store the letters "Computer Science"? Give your reason. (1)

Answer

16 bytes – one character per byte.

2. Convert the letters "Computer Science" to their ASCII codes in decimal. (2)

Answer

C – 67	space – 32
o – 111	S – 83
m – 109	c – 99
p – 112	i – 105
u – 117	e – 101
t – 116	n – 110
e – 101	c – 99
r – 114	e – 101

3. Convert the following 2's complement binary numbers to decimal, octal, & hexadecimal:

a) 1110001001 (3)

b) 0110101110 (3)

Answer:

a) 1110001001

= 0001110110 flip bits

\+ 1

= 0001110111

$= 1\times2^6 + 1\times2^5 + 1\times2^4 + 1\times2^2 + 1\times2^1 + 1\times2^0$

= 119

Therefore, 1110001001 = **-119_{10}** **$\boxed{1110001001 = -119_{10}}$**

111 110 001 001

7 6 1 1 **$\boxed{7611_8}$**

1111 1000 1001

F 8 9 **$\boxed{F89_{16}}$**

b) 0110101110

$= 1\times2^8 + 1\times2^7 + 1\times2^5 + 1\times2^3 + 1\times2^2 + 1\times2^1$
$= 430$

$\mathbf{430_{10}}$

110 101 110
6 5 6

$\mathbf{656_8}$

0001 1010 1110
1 A E

$\mathbf{1AE_{16}}$

4. Using 6-bit 2's complement binary arithmetic, perform the following calculations. Specify whether the calculation can or cannot be performed, or whether it produces an overflow or overflow error.

   a) 23 - 11 (1)
   b) 8 + 53 (1)
   c) 14 + (-17) (1)

Answer:

a)

```
  010111
- 001011
  001100
```

b)

```
  001000
- 110101      out of range - cannot be performed
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c)

```
  001110
+ 101111
  111101
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