

ICS Homework Week 5

October 15, 2021

1. **Byte Ordering & C Pointers** Given the following definition of C variables, fill in the table below. You need to give the value of each expression for big-endian and little-endian, respectively.

```
1 int a = 0xdeadbeaf;  
2 unsigned char *p_a = (unsigned char *)&a;  
3  
4 char s[] = {1, 2, 3, 4, 5, 6, 7, 8};  
5 short *p_s = (short *)(s + 1);
```

Expression	Little-endian	Big-endian
p_a[0]	0xaf	0xde
p_a[1]	0xbe	0xad
p_a[2]	0xad	0xbe
p_a[3]	0xde	0xaf
s[0]	8	1
*(s+7)	8	8
p_s[2]	0x34	0xb7

2. **Integer Encoding** Given the following C expressions, give their binary encoding in binary or hex format. Assume the C code runs on a x86-64 machine.

```
1 int32_t l = 3;  
2  
3 char c1 = 7;  
4 char c2 = -7;  
5 short s1 = -7;  
6  
7 int i1 = -1;  
8 int i2 = 0xffffffffc;
```

```

9  int i3 = ~i2 + 1;
10 int i4 = ~-i2 + 1;
11
12 char *str = "1234567";
13 char delta = str[7] - str[0];

```

Expression	Binary Encoding
l	0x00000003
c1	0x07
c2	0xF9
s1	0xFFF9
i1	0xFFFFFFFF9
i3	0x00000004
i4	0xFFFFFFFFC
delta	0xD9

3. **Type Casting** Assume we are using **64-bit machine**. Consider the following program.

```

1  char a = -6;
2  unsigned char b = a;
3  unsigned short c = a;
4  int d = a;
5  short e = 0xcafe;
6  unsigned char f = e;
7  unsigned int g = e;

```

Write the value of variables below in decimal.

Variable	Value
a	-6
b	250
c	65530
d	-6
e	13570
f	254
g	65534