

ICS Homework Week 4

October 8, 2022

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] | 1 | 1 |
| *(s+7) | 8 | 8 |
| p_s[2] | 0x0706 | 0x0607 |

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 i1 = 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 | 0xffff9 |
| i1 | 0xffffffff |
| i3 | 0x00000004 |
| i4 | 0xffffffffc |
| delta | 0xcf |

Handwritten notes:

- Red bracket on the left side of the table, spanning from the 'c1' row down to the 'delta' row.
- Red text "Byte" written next to the first row (l).
- Red text "2" written next to the last row (delta).