

Problem Sheet #6

Problem 6.1: IEEE 754 floating point numbers

(1+1 = 2 points)

You are designing an 8-bit floating point number format that follows the design of the IEEE 754 floating point formats for single precision and double precision numbers. You allocate one bit for the sign, 3 bits for the exponent, and 4 bits for the mantissa.

```
0
0 1 2 3 4 5 6 7
+---+---+---+---+
|S| exp | mant |
+---+---+---+---+
```

- What is the range of the exponent and what is the exponent bias? Explain why.
- What are the largest and smallest positive floating point numbers you can represent? Explain why.

Problem 6.2: unicode and utf-8 encoding

(2+2 = 4 points)

The content of a file containing UTF-8 Unicode encoded text is given by the following sequence of bytes in hexadecimal notation:

```
f0 9f 98 b8 20 3d 20 f0 9f 98 80 20 2b 20 f0 9f 90 88 0a
```

- Write each byte in binary notation.
- Identify the unicode code points of the characters. What is the text stored in the file?

Problem 6.3: valid utf-8 encodings and unicode code points

(1+1+1+1 = 4 points)

Given the following byte sequences, determine whether they are valid UTF-8 encodings. Explain your reasoning.

- 0xc1 0x82
- 0xe4 0xa2 0x68
- 0xf4 0x80 0x80 0x80
- 0xf5 0x8f 0x8f 0x8f