# Quiz 1

Alloted time: 45 minutes

**Instructions:**

- There are two questions with sub-parts, printed over two sides of a sheet.

- Discussions amongst the students are not allowed. Any dishonesty shall be penalized heavily.

- Be clear in your arguments. Vague arguments shall not be given full credit.

1. Consider a 5-bit floating-point representation based on the IEEE floating-point format, with one sign bit, two exponent bits ($k = 2$), and two fraction bits ($n = 2$).

   (a) Compute the bias.

   (b) Compute e, E, f, M and the fractional value for each of the following 5 bit floating point representations: 0 00 01, 0 00 11, 0 01 10, 1 01 11, 0 10 01 and 0 01 00.

   | | | |
   |---|---|---|
   | e | : | The value represented by considering the exponent field to be an unsigned integer |
   | E | : | The value of the exponent after biasing |
   | f | : | The value of the fraction |
   | M | : | The value of the significand |
   | $2^E \times M$ | : | The (unreduced) fractional value of the number |

   (c) Compute the value of the smallest normalized number and the largest denormalized numbers under the given 5-bit floating point representation.

   $$[2 + (6 \times 5 \times 0.5) + 3 \text{ marks}]$$

2. The following (uncommented) assembly code was modified from what was discussed in class.

```
.factorial:
        cmp r0, 1
        beq .return
        bgt .continue
        b .return
.continue:
        sub sp, sp, 8
        st r0, [sp]
        st ra, 2[sp]
        sub r0, r0, 1
        call .factorial
        ld r0, [sp]
```