University of London

Computing and Information Systems/Creative Computing

CO1110 Introduction to computing and the internet

Coursework assignment 1 2018–19

This coursework assignment consists of four questions. Full marks will be awarded for complete answers to all four questions. The marks for each part of a question are indicated at the end of the part in [.] brackets.

There are 100 marks available from this coursework assignment.

Your coursework should be submitted as a single PDF file, using the following file-naming conventions:

YourName_SRN_COxxxxcw#.pdf (e.g. MarkZuckerberg_920000000_CO1110cw1.pdf)

- ***YourName*** *is your name as it appears on your student record (check your student portal);*
- ***SRN*** *is your Student Reference Number, for example 920000000;*
- ***COXXXX*** *is the course number, for example CO1110; and*
- ***cw#*** *is either cw1 (coursework 1) or cw2 (coursework 2).*

You should read the CO1110 subject guide and recommended reading for this course before completing this coursework assignment. In addition, you should also consult appropriate library and internet resources. It is important that your submitted assignment is your own individual work and, for the most part, written in your own words. You must provide appropriate in-text citation for both paraphrase and quotation, with a detailed reference section at the end of your assignment (this should not be included in any word count). Copying, plagiarism and unaccredited and wholesale reproduction of material from books or from any online source is unacceptable, and will be penalised (see our guide on how to avoid plagiarism on the VLE).

Question 1

a. The positive decimal number **1025.25** is represented in IEEE 754 32-bit format as:

$$0\ 1000\ 1001\ 0000\ 0000\ 0101\ 0000\ 0000\ 000$$

Demonstrate step-by-step how to transform the decimal number 1025.25 into its IEEE 754 32-bit representation. Start by converting 1025.25 to its unsigned binary representation, and then make sure to explain every step, identifying the mantissa and the normalised mantissa, the exponent (can be given in decimal), the biased exponent, and the sign bit. [15 marks]

b. The result of a calculation with IEEE 754 numbers is:

$$1.10111 \times 2^{-130}$$

Give this number in IEEE 754 32-bit denormalised form. You may give the exponent in decimal. [10 marks]

Question 2

Consider the following 4-bit two's complement addition:

```
  1001
  1010
 -----
 10011
 =====
```

a. Does the result of the above addition show an overflow? Justify your answer. [6 marks]

b. Sign extend 1001 and 1010 to 6 bit two's complement and perform the addition again. Show all your working.

Does the result show an overflow? Justify your answer. [15 marks]

Question 3

In the following be sure to explain your answers in words, as well as giving the numeric result. Please note that students who write down only a numeric answer with no explanation will lose marks. You may give the numeric part of your answers as powers of 2, where appropriate.

a. Draw a simplified diagram of a decoder with 4 inputs. Label all inputs and outputs. [9 marks]

b. Consider a memory comprised of 256 x 8-bit RAM chips. Memory is byte addressable. Given that there are 128 chips:

(i) How many addressable memory locations are there?

(ii) How many bits must memory addresses have in order to uniquely address each byte of memory?

(iii) How many address lines are needed for chip select?

(iv) How many address lines are needed to select a memory location on a chip? [20 marks]

c. Suppose that we have a memory of the same size as that described in (b), in that it is composed of 128 chips, and the chips are again 256 x 8-bit RAM chips. However now the memory is word addressable, and a word has 64 bits.

(i) How many addressable memory locations are there in this memory?

(ii) 1111 1010 1001 is the address of a particular word in this memory.

Identify the bits of this address used for chip select, and the bits used to identify the word. [10 marks]

Question 4

The following question was given to students in an examination:

> *Temporal locality* and *spatial locality* are jointly known as *locality of reference*. Describe in ***one or two sentences*** how the cache uses spatial locality to increase the cache hit rate.

A student gave the following answer:

> Cache memory uses spatial locality to increase the cache hit rate by storing frequently used addresses.

The student received no marks for this answer.

Write a sentence that you think would be a better answer to the question. [15 marks]

[Total 100 marks]

[END OF COURSEWORK ASSIGNMENT 1]