COMP1211 Computer Architecture

Coursework 1

Deadline: 10am Tuesday 31st October 2017

Completed paper solutions to this coursework must be posted through the Coursework Postbox before the deadline, with a Coursework Header Sheet attached. Tidy handwritten submissions are acceptable: it is not necessary to type up this work, but typescript is equally welcome. Untidy, illegible or partly illegible work is not acceptable. The work should be on A4 sized paper (or similar), and all four edges of the paper should be straight, not ragged or torn. Pages should be stapled together; please do not put your work in a plastic folder. Coursework Header sheets are available in the Long Room, and in the Computing Organisation in Minerva, under Useful Forms.

An online submission should also be made in Minerva. The online submission does not require a Header Sheet; scanned and pdf online submissions are acceptable.

This Coursework represents 15% of the assessment of the module, and will be marked out of 15. Questions 1 to 6 will receive 1 mark each, questions 7 and 8 two marks each, and question 9 five marks.

1. Convert the following binary numbers to base ten.

   (a) 1010

   (b) 11011

2. Convert the following base ten numbers to binary.

   (a) 47

   (b) 8049

not twos compliment

3. Add the following binary numbers:

   (a)

$$\begin{array}{rcccccccc} & 1 & 0 & 1 & 0 & 1 & 1 & 0 & 0 \\ + & 1 & 1 & 1 & 1 & 0 & 1 & 1 & 0 \\ \hline \end{array}$$

   (b)

$$\begin{array}{rcccccccc} & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 1 & 1 \\ + & & & & & & & & & 1 \\ \hline \end{array}$$

   (c)

$$\begin{array}{rcccccccc} & 1 & 1 & 0 & 0 & 0 & 1 & 1 & 0 & 1 \\ + & & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 1 \\ \hline \end{array}$$

4. Multiply the following binary numbers:

   (a)
   $$\begin{array}{rcccc} & 1 & 1 & 0 & 1 \\ \times & & 1 & 1 & 0 \\ \hline \end{array}$$

   (b)
   $$\begin{array}{rccccc} & 1 & 1 & 1 & 1 & 1 \\ \times & & 1 & 0 & 1 & 1 \\ \hline \end{array}$$

5. Convert the following hexadecimal numbers directly to binary.

   (a) $6AF4$

   (b) 2099

6. Convert the following binary numbers directly to hexadecimal.

   (a) 1001101100111101

   (b) 100100010001010

7. Convert the following binary number to base ten (fixed point): 1101.01

8. Convert the base ten number 23.625 to fixed point binary.

9. Calculate how the base 10 number 25.125 is represented as a 32 bit floating point number on a computer where (as is standard) the first bit is the sign, the next 8 bits are the exponent (represented in 127 bias notation) and the remaining 23 bits represent the mantissa (with the usual normalisation). (First transfer the number into fixed point binary format, and then transfer this into floating point.)
   Show your working at each stage. **show work**

The End.