# Homework 1 Floating point form Answers

1. A certain computer holds floating point binary numbers using an 8-bit mantissa and a 4-bit exponent.

 (a) Convert the following numbers from floating point binary.

 (i) 0.1011100 0011 [1]

 5.75

 (ii) 1.0101101 0101 [1]

 -20.75

 (b) Convert the following numbers from decimal to normalised floating point binary.

 (i) 13.25 [2]

 In fixed point binary this is 1101.01

 In normalised form the first digit after the binary point must be 1, so move the binary point 4 places left and set the exponent equal to 4.

 Answer: 0.1101010 0100

 (ii) -13.25 [2]

 Find the twos complement, 10010.110

 In normalised form, the first digit after the sign bit must be 0, so move the point 4 places left and set the exponent to 4

 Answer: 1.0010110 0100

2. (a) What is the purpose of normalising a floating point binary number? [2]

 It ensures the maximum level of precision for a given number of bits

 (b) What is the most negative number that can be held in an 8-bit mantissa and a 4-bit exponent, expressed as a decimal number? [2]

 1.0000000 0111 = -128

3. Insert the missing words in the following sentence:

 In floating point binary representation, the larger the mantissa, the greater the \_\_\_precision\_\_\_ and the larger the exponent, the greater the \_\_\_\_\_range\_\_\_\_\_ [2]

4. Numbers are stored in a computer system using fixed point binary with 5 places before and 7 places after the binary point.



 (a) What is the maximum value that can be held, to the nearest whole number? 32 [1]

 (b) Explain what is meant by **underflow**. Describe a situation in which it could occur. [2]

 When a number is too small to be represented. It could occur when storing the result of a number being divided by another e.g. 0.0078125 / 2

 Total 15 marks