(1) What is the advantage of using “normalized” format in IEEE-754 standard?

By normalizing the significand bits, the 23 significand bits in IEEE-74 floating-point standard works as 24 significand bits (we get one more bit for the significand bits).

(2) Show the binary bit pattern for -182.625\(_{(10)}\) in IEEE-754 format. Show all your work.

- \(182\,(10) = 10110110\,(2)\)
- \(0.625\,(10) = 0.101\,(2)\)

\[182.625\,(10) = 10110110.101\,(2) = 1.0110110101 \times 2^7\]

The binary bit pattern for ‘7’ in “bias of 127” is:

\[
\begin{align*}
0: & 011111111 \\
+ 7: & 111 \\
\hline
\text{1000 0110}
\end{align*}
\]

Sign Bit: 1
Exponent Bits: 10000110
Significand Bits: 0110110101 followed by 13 ‘0’s
(3) Show the binary bit pattern for “the tiniest negative” number in IEEE-754 floating point numbers

![Diagram of number line showing Smallest Negative, Tiniest Negative, Tiniest Positive, Largest Positive

Sign Bit: 1
Exponent Bits: 0000 0001
Significand Bits: 00 … 00 (23 0’s)

(4) What are the five different types of the numbers IEEE-754 floating-point numbers that can not be accurately represented by a processor (answer the names of the five different types of the numbers – not explanations of the five types of the numbers)?

① Positive Overflow
② Positive Underflow
③ Negative Underflow
④ Negative Overflow
⑤ Precision Errors

(5) What are “super-scalar datapath processors”?

A super-scalar processor is a processor that has two or more scalar datapath.