Recitation – Float format

Find the floating point representation of:

1. -23.5

Sign bit:1 (negative)

Integer part: 23=10111

Decimal part: 0.5=.1

Mantissa: 10111100000000000000000

Exponent: 4+127=131=10000011

Float=11000001110111100000000000000000

1. 0.025

Sign bit: 0 (positive)

Integer part: 0

Decimal part:

Text

Description automatically generated

Mantissa=11001100110011001100110

Exponent=-1+127=01111110

Float=00111111011001100110011001100110

1. 0.0045

Sign bit:0

Integer part:0

Decimal part: .00000001001001101110100. Used this code:

Graphical user interface, application, Word

Description automatically generated

Mantissa: 10010011011101000000000

Exponent:-8+127=119=01110110

Float: 00111011010010011011101000000000

1. 0.00025

Sign bit: 0

Integer part:0

Decimal part: .00000000000100000110001 (used same code)

Mantissa: 10000011000100000000000

Exponent:-12+127=115=01110010

Float:00111001000000000000100000110001

Submit your solutions on Brightspace as a pdf file of all the answers with steps as well as the answer to these questions.

1. Why are there denormalization and normalization patterns for float?

Normalization patterns are the default for floats, used to store non-whole numbers efficiently, as one can get very small or very large just by changing the exponent (similar to scientific notation).

Denormalization patterns are a few special encodings. The most notable is when the exponent is 0, used to store values very close to 0, as this indicates that the mantissa has no leading 0. Another one is exponent=all 1s and mantissa = all 0s, which indicates infinity.

1. Could the mantissa be all zeroes? Why or Why not? If no, why. If yes, provide an example

The mantissa could be all zeroes only if the number is zero (in which case the float is all 0). If not, the mantissa always starts with the leading 1.

1. Why does all ones in the exponent mean?

All 1s in exponent and all 0s in mantissa means infinity.

All 1s in exponent and some other value in mantissa means there was a NaN error.