Assignment 4

Convert the decimal value -47.7 to IEEE single-precision Floating-Point binary representation. (15)

1. Use IEEE 32-bit single-precision Floating-point binary representation
2. Sign bit (0 if positive, and 1 if negative)

1 because the value we are given to evaluate is -47.7

1. Evaluation:

47.7 (because sign bit has already been determined)

47 / 2 = 23 Remainder 1

23 / 2 = 11 Remainder 1

11 / 2 = 5 Remainder 1

5 / 2 = 2 Remainder 1

2 / 2 = 1 Remainder 0

1 / 2 = 0 Remainder 1

0.7 \* 2 = 1.4 Remainder 1

0.4 \* 2 = 0.8 Remainder 0

The values of the decimal are repeating, which can explain why the mantissa has repeating bits of 00 11 00 11

0.8 \* 2 = 1.6 Remainder 1

0.6 \* 2 = 1.2 Remainder 1

0.2 \* 2 = 0.4 Remainder 0

0.4 \* 2 = 0.8 Remainder 0

0.8 \* 2 = 1.6 Remainder 1

1. Normalize for mantissa and unbiased exponent

101111**.**1011001 = 1**.**011111011001 \* 25

1. Determine Biased Exponent

5 + 127 = 13210 = 100001002

1. Remove Leading 1 from mantissa

1.011111011001 = 01111101100110011001101

The 32-bit IEEE Single-Precision Floating-Point Binary Representation should be

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |

Mantissa [23-bits]

Sign Bit [1-bit]

Exponent[8-bits]