# Lab 6: **Floating-Point Binary Representation**

1. For each of the following binary floating-point numbers, supply the equivalent value as a base 10 fraction, and then as a base 10 decimal. The first problem has been done for you:

|  |  |  |
| --- | --- | --- |
| **Binary Floating-Point** | **Base 10 Fraction** | **Base 10 Decimal** |
| 1.101 *(sample)* | 1 5/8 | 1.625 |
| 11.11 | 3 3/4 | 3.75 |
| 1.1 | 1 1/2 | 1.5 |
| 101.001 | 5 1/8 | 5.125 |
| 1101.0101 | 13 5/16 | 13.3125 |
| 1110.00111 | 14 7/32 | 14.21875 |
| 10000.101011 | 32 43/64 | 32.671875 |
| 111.0000011 | 7 3/128 | 7.0234375 |
| 11.000101 | 3 5/64 | 3.078125 |

2. For each of the following exponent values, shown here in decimal, supply the actual binary bits that would be used for an 8-bit exponent in the

IEEE Short Real format. The first answer has been supplied for you:

|  |  |
| --- | --- |
| **Exponent (E)** | **Binary Representation** |
| 2 *(sample)* | 10000001 |
| 5 | 10000100 |
| 0 | 01111111 |
| -10 | 01110101 |
| 128 | 11111111 |
| -1 | 01111110 |

3. For each of the following floating-point binary numbers, supply the normalized value and the resulting exponent. The first answer has been

supplied for you:

|  |  |  |
| --- | --- | --- |
| **Binary Value** | **Normalized As** | **Exponent** |
| 10000.11 *(sample)* | 1.000011 | 4 |
| 1101.101 | 1.101101 | 3 |
| .00101 | 1.01 | -3 |
| 1.0001 | 1.0001 | 1 |
| 10000011.0 | 1.0000011 | 7 |
| .0000011001 | 1.1001 | -6 |

4. For each of the following floating-point binary examples, supply the complete binary representation of the number in IEEE Short Real format. The

first answer has been supplied for you:

|  |  |
| --- | --- |
| **Binary Value** | **Sign, Exponent, Mantissa** |
| -1.11 *(sample)* | 1 01111111 11000000000000000000000 |
| +1101.101 | 0 10000010 10110100000000000000000 |
| -.00101 | 1 01111100 01000000000000000000000 |
| +100111.0 | 0 10000100 00111000000000000000000 |
| +.0000001101011 | 0 01111000 10101100000000000000000 |