disc1

October 27, 2022

1. - 1.1 True.
   - 1.2 False
   - 1.3 False
   - 1.4 True

2. (a)

   - Binary: <u>0b10010011</u>
Hex: 0x93
Dec: 147
   - Binary: 0b01001111
Hex: ~~0x39~~(0x3F)
Dec: <u>63</u>
   - Binary: <u>0b00100100</u>
Hex: 0x24
Dec: 36
   - Binary: 0b0
Hex: 0x0
Dec: <u>0</u>
   - Binary: 0b00100111
Hex: 0x27
Dec: <u>39</u>
   - Binary: 0b0000000110110101
Hex: 0x01B5
Dec: <u>437</u>
   - Binary: 0b0000000100100011
Hex: <u>0x0123</u>
Dec: 291

(b)

- 0b1101 0011 1010 1101
- 0b1011 0011 0011 1111
- 0b0111 1110 1100 0100

(c)
64Ki 128Mi 8Ti 64Gi
~~8Ti~~(16Gi) 2Ei 128Ti 512Pi
(d)
$2^{\cancel{12}(11)}$ 2^{19} 2^{24}
2^{58} 2^{36} 2^{67}

3. (a)
Unsigned: 0xFF(255) 0x0(0)
Biased: 0xFF(128) 0x0(-127)
Two's: 0x7F(127) 0x80(-128)
(b)
Unsigned: 0x0 0x1 No way
Biased: 0x7F 0x80 0x7E
Tow's: 0x0 0x1 0xFF
(c)
Unsigned: 0x11 No way
Biased: 0x90 0x6E
Two's: 0x11 0xEF
(d) ~~127~~(There is no such integer. For example, an arbitrary 8-bit mapping could choose to represent the numbers from 1 to 256 instead of 0 to 255.)
(e)...
(f) I don't know.
Decimal is the preferred radix for human hand calculations, likely related to the fact that humans have 10 fingers.

Binary numerals are particularly useful for computers. Binary signals are less likely to be garbled than higher radix signals, as there is more distance (voltage or current) between valid signals. Additionally, binary signals are quite convenient to design circuits, as well see later in the course.

Hexadecimal numbers are a convenient shorthand for displaying binary numbers, owing to the fact that one hex digit corresponds exactly to four binary digits.

4. (a)
   - 0b010010(18) No overflow
   - 0b011101(29) Overflow
   - 0b000001(1) Not Overflow (-5 + 6 = 1)
   - Impossible(0xAA is at least 8 bits)

   (b)
   - 9
   - 6
   - ~~6~~(7)
   - 44