09/19/2023 Noah Semashkevich

COSC 211 Lab 1

Question 1

① Server ② Terabyte ③ Petabyte

④ Supercomputers ⑤ CPU ⑥ Multicore Processors

⑦ Embedded Computer ⑧ Desktop Computers

⑨ Compiler ⑩ Assembler ⑪ Machine Language

⑫ Instruction ⑬ Assembly Language

⑭ Operating System ⑮ Bit ⑯ High-level Language

Question 2

a) $(10010010)_2$

$= (0 \times 2^0) + (1 \times 2^1) + (0 \times 2^2) + (0 \times 2^3) + (1 \times 2^4) + (0 \times 2^5) + (0 \times 2^6) + (1 \times 2^7)$

$= 2 + 16 + 128$ $\boxed{= (146)_{10}}$

b) $(11111111)_2$

$= (1 \times 2^0) + (1 \times 2^1) + (1 \times 2^2) + (1 \times 2^3) + (1 \times 2^4) + (1 \times 2^5) + (1 \times 2^6) + (1 \times 2^7)$

$= 1 + 2 + 4 + 8 + 16 + 32 + 64 + 128$

$\boxed{= (255)_{10}}$

Kilroy

c) $(01010110)_2$

$= (0\times2^0) + (1\times2^1) + (1\times2^2) + (0\times2^3) + (1\times2^4) + (0\times2^5) + (1\times2^6) + (0\times2^7)$

$= 2 + 4 + 16 + 64$ $\boxed{= (86)_{10}}$

d) $(0xFFFF)_{hex}$ F = 15

$= (F\times16^0) + (F\times16^1) + (F\times16^2) + (F\times16^3)$

$= (15\times16^0) + (15\times16^1) + (15\times16^2) + (15\times16^3)$

$= 15 + 240 + 3840 + 61440 = \boxed{(65535)_{10}}$

e) $(0xA101)_{hex}$ A = 10

$= (1\times16^0) + (0\times16^1) + (1\times16^2) + (A\times16^3)$

$= (1\times16^0) + (0\times16^1) + (1\times16^2) + (10\times16^3)$

$= 1 + 0 + 256 + 40960$

$\boxed{= (41217)_{10}}$

Question 3

a) 3-bit binary numbers $= (111)_2$

$= (1\times2^0) + (1\times2^1) + (1\times2^2) = \boxed{(7)_{10}}$

$= 1 + 2 + 4$

Also equal to $2^3 - 1 = 8 - 1 = 7$

b) 8-bit binary number $= (11111111)_2$

$= (1\times2^0) + (1\times2^1) + (1\times2^2) + (1\times2^3) + (1\times2^4) + (1\times2^5) + (1\times2^6) + (1\times2^7)$

$= 1 + 2 + 4 + 8 + 16 + 32 + 64 + 128$

$\boxed{= (255)_{10}}$

Also equal to $2^8 - 1 = 256 - 1 = \boxed{255}$

c) 16-bit binary number = $(1111111111111111)_2$

Too large to write out, but following pattern $2^n - 1$.

$2^{16} - 1 = (65535)_{10}$

d) 32-bit binary number = way too large to write

$2^{32} - 1 = 4294967295$

e) A 2-digit hexidecimal Number = FF

$(15 \times 16^0) + (15 \times 16^1) = 255$

Following above pattern, also $16^2 - 1$ also works, 16 this time for hexidecimal base 16

Question 4

a) $2^0 = 1$ b) $2^1 = 2$ c) $2^2 = 4$

d) $2^3 = 8$ e) $2^4 = 16$ f) $2^5 = 32$

g) $2^6 = 64$ h) $2^7 = 128$ g) $2^8 = 256$

i) $2^9 = 512$ j) $2^{10} = 1024$ l) $2^{11} = 2048$