Exercise Questions for August 19, 2019 (SOLUTIONS)

QUESTION #1

Transform 389\(_{10}\) to the binary format (in binary number) and the hex-decimal format. Show all intermediate work.

**Note:** \(X_{(10)}\) means ‘\(X\)’ is in the decimal, \(X_{(16)}\) means ‘\(X\)’ is in the hexa-decimal, and \(X_{(2)}\) means ‘\(X\)’ is in the binary.

**Binary:**

\[
389_{(10)} = 256_{(10)} + 128_{(10)} + 4_{(10)} + 1_{(10)}
\]

\[
= 2^8 + 2^7 + 2^2 + 2^0
\]

\[
= 110000101_{(2)}
\]

**Hexa-Decimal:**

\[
389_{(10)} = 256_{(10)} + 128_{(10)} + 5_{(10)}
\]

\[
= (256 \times 1) + (16 \times 8) + (1 \times 5)
\]

\[
= (16^2 \times 1_{(16)}) + (16^1 \times 8_{(16)}) + (16^0 \times 5_{(16)})
\]

\[
= 185_{(16)}
\]

QUESTION #2

Transform A2D\(_{16}\) to the decimal format (in decimal number) and the binary format (binary number). Show all intermediate work.

**Decimal:**

\[
A2D_{(16)} = (16^2_{(10)} \times A_{(16)}) + (16^1_{(10)} \times 2_{(16)}) + (16^0_{(10)} \times D_{(16)})
\]

\[
= (256_{(10)} \times 10_{(10)}) + (16_{(10)} \times 2_{(10)}) + (1_{(10)} \times 13_{(10)})
\]

\[
= 2560_{(10)} + 32_{(10)} + 13_{(10)}
\]

\[
= 2605_{(10)}
\]

**Binary:**

\[
2605_{(10)} = 2048_{(10)} + 512_{(10)} + 32_{(10)} + 8_{(10)} + 4_{(10)} + 1_{(10)}
\]
\[ 10110101001_{(2)} = 2^{11} + 2^{10} + 2^8 + 2^7 + 2^5 + 2^3 + 2^0 \\
= 101000101101_{(2)} \]

**QUESTION #3**

Transform 10110101001\(_{(2)}\) to the decimal format (in decimal number) and the hex-decimal format. Show all intermediate work.

**Decimal:**

\[
10110101001_{(2)} = 2^{11} + 2^{10} + 2^8 + 2^7 + 2^5 + 2^3 + 2^0 \\
= 2048 + 1024 + 512 + 128 + 32 + 8 + 1 \\
= 1024_{(10)} + 256_{(10)} + 128_{(10)} + 32_{(10)} + 8_{(10)} + 1_{(10)} \\
= 1449_{(10)}
\]

**Hexa-Decimal:**

\[
1449_{(10)} = (256 \times 5) + (16 \times 10) + (1 \times 9) \\
= (16^2 \times 5_{(16)}) + (16^1 \times A_{(16)}) + (16^0 \times 9_{(16)}) \\
= 5A9_{(16)}
\]

**QUESTION #4**

How many digits are needed for 1,024\(_{(10)}\) in binary and hex-decimal numbers? Show all intermediate work.

**Binary:** 1024\(_{(10)}\) = 10000000000\(_{(2)}\)  
(11 digits)

**Hexa-Decimal:**

1024\(_{(10)}\) = (256 \times 4) + (16 \times 0) + (1 \times 0)  
\[= 400_{(16)}\]  
(3 digits)