

Electrical and Computer Engineering Department
University of Massachusetts Dartmouth

ECE160: Foundations of Computer Engineering I (Spring 2023)

Homework #1 Solution (*60 points*)

Problem #1 (15 points, 7.5 points per conversion)

a) $(10100100111)_2 \rightarrow \text{Hex}$

0101 0010 0111
5 2 7

Therefore, the Hex Number is $(527)_{16}$.

b) $(10100100111)_2 \rightarrow \text{Decimal}$

$$\begin{aligned} &= 1 \cdot 2^{10} + 0 \cdot 2^9 + 1 \cdot 2^8 + 0 \cdot 2^7 + 0 \cdot 2^6 + 1 \cdot 2^5 + 0 \cdot 2^4 + 0 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 1 \cdot 2^0 \\ &= 1024 + 256 + 32 + 4 + 2 + 1 \\ &= (1319)_{10} \end{aligned}$$

NOTE: There can be other solutions, for example:

Solution 2: $(10100100111)_2 \rightarrow \text{Decimal} \rightarrow \text{Hex}$.

Solution 3: $(10100100111)_2 \rightarrow \text{Hex} \rightarrow \text{Decimal}$

Problem #2 (22.5 points, 7.5 points per conversion)

a) $(423)_{10} \rightarrow \text{HEX}$

Value	Quotient	Remainder
423	26	7
26	1	10(A)
1	0	1

Therefore, the equivalent Hex number is $(1A7)_{16}$

b) $(1A7)_{16} \rightarrow \text{BINARY}$

1 A 7
0001 1010 0111

Therefore the equivalent binary number is $(110100111)_2$

c) $(110100111)_2 \rightarrow \text{OCTAL}$

110	100	111
6	4	7

Therefore the equivalent octal number is $(647)_8$

NOTE: There can be other solutions, for example:

Solution 2: $(423)_{10} \rightarrow \text{Octal} \rightarrow \text{Binary} \rightarrow \text{Hex}$

Solution 3: $(423)_{10} \rightarrow \text{Octal} \rightarrow \text{Binary}$
 $(423)_{10} \rightarrow \text{Hex} \rightarrow \text{Binary}$

Problem #3 (22.5 points, 7.5 points per conversion)

a) $(\text{CAFÉ})_{16} \rightarrow \text{Binary}$

C	A	F	E
1100	1010	1111	1110

Therefore the binary equivalent is $(1100101011111110)_2$

b) $\text{Binary} \rightarrow \text{Octal}$

1	100	101	011	111	110
1	4	5	3	7	6

Therefore the octal number is $(145376)_8$.

c) $(\text{CAFÉ})_{16} \rightarrow \text{Decimal}$

$$\begin{aligned} &= C \cdot 16^3 + A \cdot 16^2 + F \cdot 16^1 + E \cdot 16^0 \\ &= 12 \cdot 16^3 + 10 \cdot 16^2 + 15 \cdot 16^1 + 14 \cdot 16^0 \\ &= (51966)_{10} \end{aligned}$$

NOTE: There can be other solutions for example:

Solution 2: $(\text{CAFÉ})_{16} \rightarrow \text{Decimal} \rightarrow \text{Octal} \rightarrow \text{Binary}$

Solution 3: $(\text{CAFÉ})_{16} \rightarrow \text{Binary} \rightarrow \text{Octal} \rightarrow \text{Decimal}$