

ECE 150 Digital Logic Design, Fall 2023

Quiz 1, September 13th 2023

Problem 1.

- Write the Hexadecimal number, $DF8_{16}$, as a sum of symbols (their equivalent decimal value) times weighting-factors.
- Convert $DF8_{16}$ to binary and compute its sum with $0011\ 0000\ 1111_2$.
- Convert the result of (b) back to Hex.

Solution.

(a)

$$DF8_{16} = 13 \times 16^2 + 15 \times 16^1 + 8 \times 16^0$$

(b) $DF8_{16} = 1101\ 1111\ 1000_2$.

$$\begin{array}{r} \text{carry: } 1 \quad 1111 \quad 1111 \quad 0000 \\ \quad \quad 1101 \quad 1111 \quad 1000_2 \\ + \quad 0011 \quad 0000 \quad 1111_2 \\ \hline 1 \quad 0001 \quad 0000 \quad 0111_2 \end{array}$$

(c) We convert by groups of 4, using leading zeros:

$$0001\ 0001\ 0000\ 0111_2 = 1107_{16}.$$

Problem 2. Simplify the following boolean expression using a Karnaugh-Map.

$$X = \bar{A}\bar{B}CD + \bar{A}B\bar{C}\bar{D} + ABC\bar{D} + \bar{A}BC\bar{D} + ABC\bar{D}$$

Solution.

We fill in a K-map with the SOP min-terms and circle-1s in powers of 2:

		CD			
		00	01	11	10
AB	00	0	0	1	0
	01	1	0	0	1
	11	1	0	0	1
	10	0	0	0	0

Each circled term gives a single expression in a simplified sum of products:

$$X = BC + \bar{A}\bar{B}CD$$