Assignment 1

1. Convert the following decimal numbers to binary
(d) 128 (e) 1000

(d)	Integer		Remainder	Coefficient
128/2 =	64	+	0	0
64/2 =	32	+	0	0
32/2 =	16	+	0	0
16/2 =	8	+	0	0
8/2 =	4	+	0	0
4/2 =	2	+	0	0
2/2 =	1	+	0	0
1/2 =	0	+	1	1

Answer: $(123)_{10} = (1000,0000)_2$

(e)	Integer		Remainder	Coefficient
1000/2 =	500	+	0	0
500/2 =	250	+	0	0
250/2 =	125	+	0	0
125/2 =	62	+	1	1
62/2 =	31	+	0	0
31/2 =	15	+	1	1
15/2 =	7	+	1	1
7/2 =	3	+	1	1
3/2 =	1	+	1	1
1/2 =	0	+	1	1

Answer: $(1000)_{10} = (11,1110,1000)_2$

2. Convert the following binary numbers to decimal
(b) 1000001 (c) 11101

Answer:
(b) $(1000001)_2 = 2^6 + 2^0 = (65)_{10}$
(c) $(11101)_2 = 2^4 + 2^3 + 2^2 + 2^0 = (29)_{10}$

3. Convert the values in Problem 2 to Hexadecimal
(b) 1000001 (e) 00100010

Answer:
(b) 100,0001=41H   (e) 0010,0010=22H

6. Find the 2's complement of the following binary numbers
(a) 1001010 (b) 111001 (c) 10000010 (d) 111110001

Answer:

(a)100,1010   (b)11,1001

         100,1010   11,1001
         011,0101   00,0110
  +   1   +   1
         011,0110   00,0111

(c) 1000,0010   (d) 111110001

       1000,0010   1,1111,0001
       0111,1101   0,0000,1110
  +   1   +   1
       0111,1110   0,0000,1111

7. Add the following hex values
(b) F34H+5D6H (d) FFFFH+2222H

  (b)   (d)
       F3 4H   FFFFH
  +   5D6H   +   22 22H
    150AH   122 21H
Answer: F34H+5D6H =150AH   Answer: FFFFH+2222H=122 21H

8. Perform hex subtraction for the following
(a) 24FH-129H (b) FE9H-5CCH (c) 2FFFFH-FFFFFH (d) 9FF25H-4DD99H
(a)126H   (b)
      24FH   FE9H
  −   129H   -   5CCH
     126H   A1DH
Answer: 24FH-129H=126H   Answer: FE9H-5CCH= A1DH

(c) 2FFFFH-FFFFFH
    2 FFFFH   9FF 25H
  -   FFFFFH   - 4DD99H
   1] 30000H   5 2 1 8cH
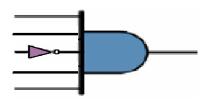Answer: 2FFFFH-FFFFFH=1]30000H   Answer: 9FF25H-4DD99H=5218cH

NOTE: '1]' shows that the minuend is not enough for subtraction, and results in a borrow of the higher order bit.

19. Show the decoder for binary 11011

Answer:

23. In a given byte-addressable computer, memory locations 10000H to 9FFFFH are available for user programs. The first location is 10000H and the last location is 9FFFFH. Calculate the following:
(a) The total number of bytes available (in decimal)
(b) The total number of kilobytes (in decimal)
Answer:

$$
\begin{array}{r}
\text{(a)} \quad 9\text{FFFFH} \\
100\ 00\text{H} \\
+ \qquad\quad 1 \\
\hline
900\ 00\text{H}
\end{array}
$$

$90000H = 589824_{10}$ (bytes)

(b) 589824_{10} (bytes) $= 576_{10}$ (Kb)

26. Find the total amount of memory, in the units requested, for each of the following CPUs, given the size of the address buses.
(a) 16-bit address bus (in K)
(b) 24-bit address bus (in meg)
(c) 32-bit address bus (in megabytes and gigabytes)
(d) 48-bit address bus (in megabytes, gigabytes and terabytes)

Answer:
(a) $2^{16} b/2^{10} = 2^6 K = 64 K$
(b) $2^{24} b = 2^{14}/2^{20} M = 2^4 M = 16 M$
(c) $2^{32} b = 2^{32}/2^{20} M = 2^{12}/2^{10} M = 2^2 G = 4 G$
(d) $2^{48} b = 2^{48}/2^{20} M = 2^{28}/2^{10} G = 2^{18}/2^{10} T = 2^8 T = 256T$

27. Regarding the data bus and address bus, which is unidirectional and which is bidirectional?

Answer:
Address bus is unidirectional.
Data bus is bidirectional.