

Number systems (concept examples)

Example 1: Convert binary number 1011010 to the octal equivalent.

SOLUTION: The first step is to rewrite the number with the digits grouped in threes: 001 011 010

Note that two zeros were placed in front of the first digit 1 in order to make every group complete.

Next, write the decimal equivalent over each group of three:

1	3	2
001	011	010

The octal equivalent of binary 1011010 is 132.

Example 2: Convert binary number 1011010 to the hexadecimal equivalent.

SOLUTION: The first step is to rewrite the number with the digits grouped in fours: 0101 1010

Note the zero were placed in front of the first digit 1 in order to make the two groups complete.

Next, write the decimal equivalent over each group:

5	A
0101	1010

The hexadecimal equivalent of binary 1011010 is 5A.

Example 3: Convert the hex number 2AE9₁₆ to binary.

SOLUTION: Write each hex digit to 4 bit group in binary system to give 2 --> 0010; A --> 1010; E --> 1110; 9 --> 1001. Putting them together gives 0010101011101001₂.

Example 4: Convert 41₁₀ to binary.

SOLUTION: First, divide 41 by 2 and list the integer quotients and remainders. ...continue the process until the integer quotient becomes 0 (see table). So, 41₂ = (101001)₂

Integer	Remainder
41	
20	1
10	0
5	0
2	1
1	0
0	1 101001 = answer

Example 5: Convert 0.6875₁₀ to binary.

SOLUTION: First, multiply 0.6875 by 2 to give an integer and a fraction. ...continue until the fraction becomes 0 or until the number of digits has sufficient accuracy. The coefficients of the binary number are obtained from the integers as shown in the table:

	Integer		Fraction	Coefficient
0.6875 × 2 =	1	+	0.3750	a ₋₁ = 1
0.3750 × 2 =	0	+	0.7500	a ₋₂ = 0
0.7500 × 2 =	1	+	0.5000	a ₋₃ = 1
0.5000 × 2 =	1	+	0.0000	a ₋₄ = 1

PHY 307: Electronics-II

Tutorial-1

(Binary, Hexadecimal and Decimal numbers)

1. (A). Binary to decimal conversion: Convert the following binary numbers to decimal,

(i). 101101_2 , (ii). $1\ 1\ 0\ 1\ 1_2$, (iii). 10110_2 , (iv). 10011100_2 .

(B). Decimal to binary conversion: Convert the following decimal numbers to binary,

(i). 13_{10} , (ii). 37_{10} , (iii). 93_{10} , (iv). 0.625_{10} .

2. (A). Binary to hexadecimal conversion: Convert the following binary numbers to hexadecimal,

(i). 10110101_2 , (ii). 0110101110001100_2 , (iii). 10_2 , (iv). 01_2 .

(B). Hexadecimal to binary conversion: Convert the following hexadecimal numbers to binary,

(i). $374F_{16}$, (ii). $FACE_{16}$, (iii). $8AD0_{16}$, (iv). $32EB_{16}$.

(C). Hexadecimal to decimal conversion: Convert the following hexadecimal numbers to decimal,

(i). $C921_{16}$, (ii). 11_{16} , (iii). $3AB_{16}$, (iv). $A1A1_{16}$.

3. Arithmetic addition in binary numbers:

(i). $+6_{10}+13_{10}$, (ii). $+6_{10}-13_{10}$, (iii). $-6_{10}+13_{10}$, (iv). $-6_{10}-13_{10}$.