



DETAILS:

Number System Conversions

Name: Mohsin Ali

Roll Number: 25P-0545

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Section: BCS-1C

Lab Task 1/Assignment 1:

Information and Communication Technology

Instructor Name: Sir Zakria Bacha

BINARY TO DECIMAL CONVERSION

Binary	Decimal
1101_2	13_{10}
1010101_2	85_{10}

o- Binary to Decimal:

$$\begin{array}{rcl} \cancel{0} \cdot \cancel{1101}_2 & : & \cancel{\sqrt{1}} \\ & & \cancel{1} \times \cancel{2^0} = 1 \\ & & \cancel{0} \times \cancel{2^1} = 0 \\ & & \cancel{1} \times \cancel{2^2} = 4 \\ & & \cancel{1} \times \cancel{2^3} = 8 \end{array}$$

$$\begin{array}{r} 1 + 0 + 4 + 8 \\ 1101 = \boxed{13_{10}} \end{array}$$

$$1101 = \boxed{13_{10}}$$

• 1010101_2 :

$$\begin{array}{r}
 1 \times 2^0 = 1 \\
 0 \times 2^1 = 0 \\
 1 \times 2^2 = 4 \\
 0 \times 2^3 = 0 \\
 1 \times 2^4 = 16 \\
 0 \times 2^5 = 0 \\
 1 \times 2^6 = 64
 \end{array}$$

$$101010_2 = 1 + 0 + 4 + 0 + 16 + 0 + 64$$

$$1010101_2 = 85_{10}$$

DECIMAL TO BINARY CONVERSION

Decimal	Binary
45_{10}	101101_2
103_{10}	1100111_2

o- Decimal : to Binary :

o- 45 :

so: $45_{10} = [101101]_2$

o- 103 :

so: $103_{10} = [1100111]_2$

BINARY TO HEXADECIMAL

(HEXADECIMAL TO BINARY EQUIVALENT TABLE IS PROVIDED AFTER 1 PAGE)

Binary	Hexadecimal
10111101_2	BD_{16}
11001011_2	CB_{16}

o. Binary to Hexadecimal:

~~BA~~

o. 10111101
 \therefore Grouping by 4 bits and then crosschecking:

$1011 \quad 1101$

$B \quad D$

$(10111101)_2 = [(BD)_{16}]$

$(10111101)_2 = [(BD)_{16}]$

o. 11001011
 \therefore Grouping by 4 bits and then crosschecking:

$1100 \quad 1011$

$C \quad B$

$(11001011)_2 = [(CB)_{16}]$

HEXADECIMAL TO BINARY

(HEXADECIMAL TO BINARY EQUIVALENT TABLE IS PROVIDED IN THE NEXT PAGE)

Hexadecimal	Binary
3A	00111010_2
F4B	111101001011_2

o- Hexadecimal to Binary :

• 3A:

∴ Write each separately and then write its equivalent binary number from the chart.

So:

$$(3A)_6 = [00111010]_2$$

So:

$$(3A)_6 = [00111010]_2$$

• F4B:

∴ Write each separately and then write its equivalent binary number from the chart.

So:

$$(F4B)_6 = [(111101001011)]_2$$

HEXADECIMAL TO BINARY EQUIVALENT TABLE

<u>Binary Equivalent</u>	<u>Hexadecimal</u>
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	A
1011	B
1100	C
1101	D
1110	E
1111	F

Referred to This table for conversion:

1. Binary to Hexadecimal.
2. Hexadecimal to Binary.

OCTAL TO DECIMAL CONVERSION

Octal	Decimal
57_8	47_{10}
244_8	164_{10}

o. Octal to Decimal :

• 57 :

$$\begin{array}{r}
 7 \times 8^0 = 7 \\
 5 \times 8^1 = 40 \\
 \hline
 \end{array}$$

Now add both:

$$(57)_8 = 40 + 7$$

$$(57)_8 = \boxed{(47)_{10}}$$

• 244 :

$$\begin{array}{r}
 4 \times 8^0 = 4 \\
 4 \times 8^1 = 32 \\
 2 \times 8^2 = 128 \\
 \hline
 \end{array}$$

Now add all :

$$(244)_8 = 128 + 32 + 4$$

$$(244)_8 = \boxed{(164)_{10}}$$

DECIMAL TO OCTAL CONVERSION

Decimal	Octal
156_{10}	234_8
73_{10}	111_8

o Decimal to Octal :

o 156 :

$(156)_{10} = (234)_8$

o 73 :

$(73)_{10} = (111)_8$