CODES CONVERSION

There are many methods or techniques which can be used to convert code from one format to another. We'll demonstrate here the following

- Binary to BCD Conversion
- BCD to Binary Conversion
- BCD to Excess-3
- Excess-3 to BCD

Binary to BCD Conversion

Steps

- **Step 1** -- Convert the binary number to decimal.
- **Step 2** -- Convert decimal number to BCD.

Example − convert 11101_2 to BCD.

Step 1 − Convert to Decimal

Binary Number − 11101_2

Calculating Decimal Equivalent −

Step	Binary Number	Decimal Number
Step 1	11101_2	$((1 \times 2^4)$ + (1×2^3) + (1×2^2) + (0×2^1) + $(1 \times 2^0))_{10}$
Step 2	11101_2	16 + 8 + 4 + 0 + 1_{10}
Step 3	11101_2	29_{10}

Binary Number − 11101_2 = Decimal Number − 29_{10}

Step 2 − Convert to BCD

Decimal Number − 29_{10}

Calculating BCD Equivalent. Convert each digit into groups of four binary digits equivalent.

Step	Decimal Number	Conversion
Step 1	29_{10}	0010_2 1001_2
Step 2	29_{10}	00101001_{BCD}

Result

$(11101)_2$ = $(00101001)_{BCD}$

BCD to Binary Conversion

Steps

- **Step 1** -- Convert the BCD number to decimal.
- **Step 2** -- Convert decimal to binary.

Example − convert 00101001_{BCD} to Binary.

Step 1 - Convert to BCD

BCD Number − 00101001_{BCD}

Calculating Decimal Equivalent. Convert each four digit into a group and get decimal equivalent for each group.

Step	BCD Number	Conversion
Step 1	00101001_{BCD}	$0010_2\ 1001_2$
Step 2	00101001_{BCD}	$2_{10}\ 9_{10}$
Step 3	00101001_{BCD}	29_{10}

BCD Number − 00101001_{BCD} = Decimal Number − 29_{10}

Step 2 - Convert to Binary

Used long division method for decimal to binary conversion.

Decimal Number − 29_{10}

Calculating Binary Equivalent −

Step	Operation	Result	Remainder
Step 1	29 / 2	14	1
Step 2	14 / 2	7	0
Step 3	7 / 2	3	1
Step 4	3 / 2	1	1
Step 5	1 / 2	0	1

As mentioned in Steps 2 and 4, the remainders have to be arranged in the reverse order so that the first remainder becomes the least significant digit LSD and the last remainder becomes the most significant digit MSD.

Decimal Number − 29_{10} = Binary Number − 11101_2

Result

$(00101001)_{BCD} = (11101)_2$

BCD to Excess-3

Steps

- **Step 1** -- Convert BCD to decimal.
- **Step 2** -- Add 3_{10} to this decimal number.
- **Step 3** -- Convert into binary to get excess-3 code.

Example − convert 1001_{BCD} to Excess-3.

Step 1 − Convert to decimal

$1001_{BCD} = 9_{10}$

Step 2 − Add 3 to decimal

9_{10} + $3_{10} = 12_{10}$

Step 3 − Convert to Excess-3

$12_{10} = 1100_2$

Result

$(1001)_{BCD} = (1100)_{XS-3}$

Excess-3 to BCD Conversion

Steps

- **Step 1** -- Subtract 0011_2 from each 4 bit of excess-3 digit to obtain the corresponding BCD code.

Example − convert 10011010_{XS-3} to BCD.

```
Given XS-3 number  = 1 0 0 1 1 0 1 0
Subtract (0011)2   = 0 0 1 1 0 0 1 1
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               BCD = 0 1 1 0   0 1 1 1
```

Result

$(10011010)_{XS-3} = (01100111)_{BCD}$