GLS UNIVERSITY

COMPUTER FUNDAMENTALS & INFORMATION TECHNOLOGY.

UNIT– IV

Data Representation

Binary Codes

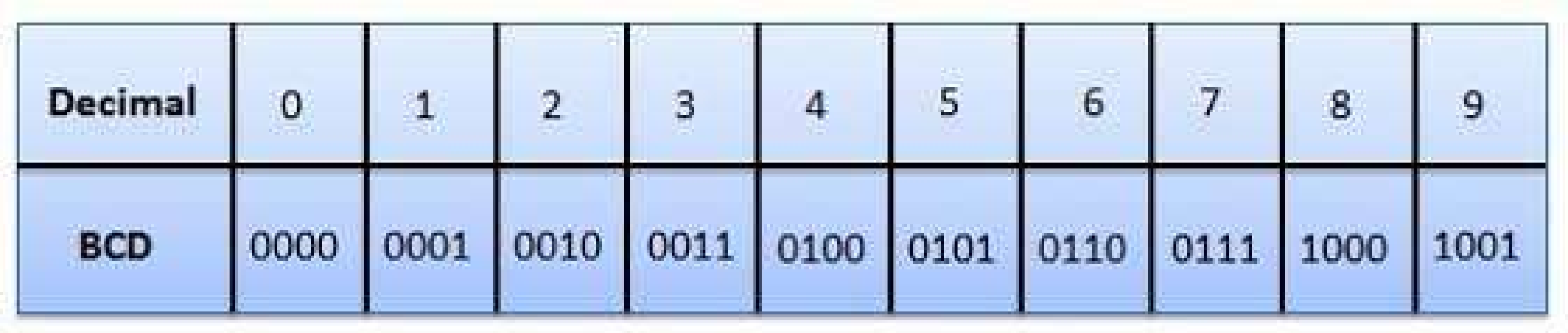
- BCD
- ASCII
- EBCDIC
- Unicode

Binary Codes & its Advantages

- Binary Codes: The group of symbols is called as a code. The digital data is represented, stored and transmitted as group of binary bits. This group is also called as binary code. The binary code is represented by the number as well as alphanumeric letter.
- Following is the list of advantages that binary code offers.
  - Binary codes are suitable for the computer applications.
  - Binary codes are suitable for the digital communications.
  - Binary codes make the analysis and designing of digital circuits if we use the binary codes.
  - Since only 0 & 1 are being used, implementation becomes easy.

BCD (Binary Coded Decimal)

- BCD is a method that uses binary digits 0 and 1 to represent decimal digits.
- Binary coded decimal are represented using 4 bits.
- In this code each decimal digit is represented by a 4-bit binary number.
- BCD is a way to express each of the decimal digits with a binary code. In the BCD, with four bits we can represent sixteen numbers (0000 to 1111). But in BCD code only first ten of these are used (0000 to 1001). The remaining six code combinations i.e. 1010 to 1111 are invalid in BCD.



Decimal	0	1	2	3	4	5	6	7	8	9
BCD	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001

Representing Decimal in BCD

Decimal Codes	BCD Digits
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110

ASCII

- ASCII – American Standard Code for Information and Interchange
- The code was originally designed as 7-bit code.
- The first 128 characters (0-127) are standard 7-bit ASCII. The next 128 (128-255) are extended ASCII as found in the first IBM PC.
- ASCII is a character encoding that uses numeric codes to represent characters. These include upper and lowercase English letters, numbers, and punctuation symbols.
- Used for transmitting and processing data amongst different computers.
- Bob Bemer developed the Ascii coding system to standardise the way computers represent letters, numbers, punctuation marks and some control codes.
- ASCII only includes letters from the English alphabet and a limited set of symbols.

ASCII

- It is the most common format for text files in computers and on the Internet. In an ASCII file, each alphabetic, numeric, or special character is represented with a 7-bit binary number (a string of seven 0s or 1s). 128 possible characters are defined.

Code	Description
0 to 31	Control Characters
48 to 57	0-9
65 to 90	A-Z
97 to 122	a-z
128 to 255	Extended ASCII code

EBCDIC

- EBCDIC – Extended Binary Coded Decimal Interchange Code.
- It is an 8-bit alphanumeric code.
- EBCDIC was first developed by IBM and is a coding method that present letters, numbers, or other symbols in a binary language. EBCDIC is similar to ASCII commonly used on most computers and computer equipment today.
- It can represent : - Alphabets
    - Numbers
    - Special symbols (>,+,|)
- It allows 256 combination of bits
- It is mainly used in IBM mainframe computers.
- ASCII code is a 7-bit code whereas EBCDIC is an 8-bit code. ASCII code is more commonly used worldwide while EBCDIC is used primarily in large IBM computers.

Unicode

- Unicode is a universal character encoding standard that assigns a code to every character and symbol in every language in the world. Since no other encoding standard supports all languages.
- Unicode is the only encoding standard that ensures that you can retrieve or combine data using any combination of languages.
- It is capable of representing approximately 1 million characters.

Number Systems

1. Non-positional number system

2. Positional number system

1. Non-positional number system

- In early days of human civilisation people used to do counting with things like stones,fingers,sticks,pebble, etc.
- This method of counting is called non-positional system.
- It was very difficult to perform arithmetic operations using this number system.
- Ex- I for 1 , II for 2 , III for 3 , IV for 4 etc...
- No symbol for 0.
- So it's too difficult to perform operations. So the Positional number system was introduced.

2. Positional number system

A positional number system is a system consisting of a finite number of symbols/digits used to represent large numbers.

The value of each digit in such a number is determined by :

1. Digit – the digit itself

2. Position – the position of the digit in the numbers. (It starts from right hand side)

3. Base (Radix) – Total number of digits available in that number system.

Types of Positional number system

Following are the various types of positional number system

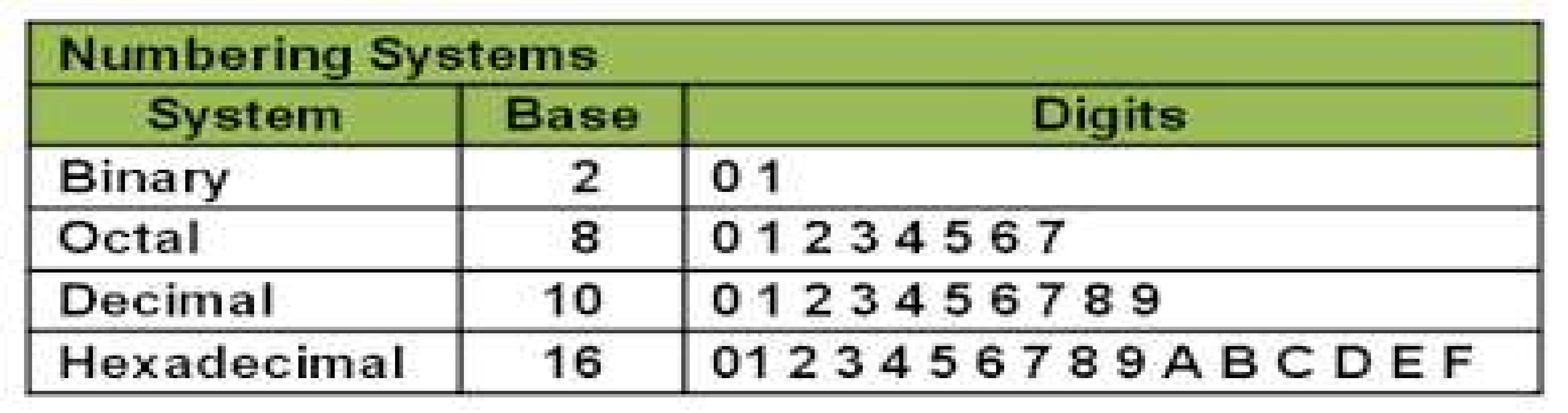
– Decimal number system

– Binary number system

– Octal number system

– Hexadecimal number system

A number in a particular base is written as (number) base



Numbering Systems		
System	Base	Digits
Binary	2	0 1
Octal	8	0 1 2 3 4 5 6 7
Decimal	10	0 1 2 3 4 5 6 7 8 9
Hexadecimal	16	01 2 3 4 5 6 7 8 9 A B C D E F

2. Binary System

Following are some terminologies used in binary system.

1) Bit (binary digit) = 0 & 1

2) Nibble = 4 bits

3) Byte = 8bits

4) Word= 16 bits / 2 bytes

5) 1KB(Kilobyte) = 1024 bytes

6) 1MB(Megabyte) = 1024 KB

7) 1 GB(Gigabyte) = 1024 MB

8) 1TB(Terabyte) = 1024 GB

9) 1PB(Petabyte) = 1024 TB

Representing decimal,binary and octal in hexadecimal

Decimal Number	Binary Number	Octal Number	Hexadecimal
0	0000	0	0
1	0001	1	1
2	0010	2	2
3	0011	3	3
4	0100	4	4
5	0101	5	5
6	0110	6	6
7	0111	7	7
8	1000	10	8
9	1001	11	9