CODES.

BCD

→ Binary coded Decimal Number Represent

→ Also known as 8-4-2-1 code.

→ Each decimal digit is represented by its 4 bit binary eq.

→ Decimal - binary and binary - decimal conversion process is complex

→ In BCD, conversion is much easier

Eg:

238	0010 0011 1000
12.39	0001 0010 . 0011 1001

→ These six 4 bit combinations

10 - 1010
11 - 1011
12 - 1100
13 - 1101
14 - 1110
15 - 1111

are not used in BCD code.

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

Addition of BCD numbers.

→ When we add 2 BCD nos. we may have to go for correction step where 6 (0110) is added to one of the nibbles.

a) either when ~~&~~ the nibble is one of the 6 invalid combinations, or there is a carry in from the previous nibble

Eg: 23 + 46

```
  0010 0011
  0100 0110
-----------
  0110 1001
```

23 + 48

```
  0010  0011
  0100  1000
-------------
  0110  1011   ← this nibble is invalid
+ 0110
-------------
  0111  0001
```

28 + 39.

```
0010 1000
0011 1001
---------
0110 0001   (carry generated)
   + 0110
---------
0110 0111
```

GRAY CODE

→ Non weighted type code.

→ Successive code words differ in only one bit.

a) Any code with this property is called as cyclic code.

→ Also called as self reflecting codes

a) If gray code for n bits is available

b) to get gray code representn for (n+1) bits, we write down 2 n bit representn one below the other with the second one being mirror image of first one.

c) We then add 0 at the beginning of first group and then add 1 at the beginning

of second group

00
01
11
10

0 00
0 01
0 11
0 10
---
1 10
1 11
1 01
1 00

0 000
0 001
0 011
0 010
0 110
0 111
0 101
0 100
---
1 100
1 101
1 111
1 110
1 010
1 011
1 001
1 000

Subject: DLCA **SEM: III**

DECIMAL	GRAY CODE	BINARY CODE
0	0 0 0 0	0 0 0 0
1	0 0 0 1	0 0 0 1
2	0 0 1 1	0 0 1 0
3	0 0 1 0	0 0 1 1
4	0 1 1 0	0 1 0 0
5	0 1 1 1	0 1 0 1
6	0 1 0 1	0 1 1 0
7	0 1 0 0	0 1 1 1
8	1 1 0 0	1 0 0 0
9	1 1 0 1	1 0 0 1
10	1 1 1 1	1 0 1 0
11	1 1 1 0	1 0 1 1
12	1 0 1 0	1 1 0 0
13	1 0 1 1	1 1 0 1
14	1 0 0 1	1 1 1 0
15	1 0 0 0	1 1 1 1

EXCESS - 3 CODE.

→ This is another form of BCD code in which each decimal digit is coded into a 4 bit binary code.

→ The code for each decimal digit is obtained by adding decimal 3 to the natural BCD code of the digit

→ Eg: Decimal 2 ⇒ 0010 + 0011
= 0101 in Excess-3

→ It is a non weighted code.

Decimal no.	BCD	Excess-3
0	0000	0011
1	0001	0100
2	0010	0101
3	0011	0110
4	0100	0111
5	0101	1000
6	0110	1001
7	0111	1010
8	1000	1011
9	1001	1100

ASCII CODES

Alphanumeric codes (also known as character codes) are defined as binary codes used to represent alphanumeric data. The codes write alphanumeric data, including letters of the alphabet, mathematical symbols, numbers, and punctuation marks, in a form that is easily understood by a computer.

Input-output devices such as keyboards, monitors, and mouses can be interfaced using these codes.

The most common alphanumeric codes used these days are ASCII code, EBCDIC code, and UNICODE.

The full form of ASCII code is the American Standard Code for Information Interchange.

This code consists mostly of letters and numbers plus a few basic symbols such as $ and %. It is a 7 bit code which means it can have 128 characters which includes 26 uppercase alphabets, 26 lowercase alphabets, 10 numeric digits (0-9) plus punctuation characters and some other symbols.

The fact that almost everyone agrees on ASCII makes it relatively easy to exchange information between different programs, different operating systems, and even different computers.

In ASCII, each character has a number which the computer or printer uses to represent that character. For instance, a capital A is number 65 in the code.

Standard ASCII Codes

Decimal	Binary	Character	Description
0	00000000	NUL	NULL
1	00000001	SOH	Start of heading
2	00000010	STX	Start of text
3	00000011	ETX	End of text
4	00000100	EOT	End of transmit
5	00000101	ENQ	Enquiry
6	00000110	ACK	Acknowledgement
7	00000111	BEL	Audible bell
8	00001000	BS	Backspace
9	00001001	HT	Horizontal tab
10	00001010	LF	Line feed
11	00001011	VT	Vertical tab
12	00001100	FF	Form feed
13	00001101	CR	Carriage return
14	00001110	SO	Shift out
15	00001111	SI	Shift in
16	00010000	DLE	Data link escape
17	00010001	DC1	Device control 1
18	00010010	DC2	Device control 2
19	00010011	DC3	Device control 3
20	00010100	DC4	Device control 4
21	00010101	NAK	Neg. acknowledge
22	00010110	SYN	Synchronous idle
23	00010111	ETB	End trans. block
24	00011000	CAN	Cancel
25	00011001	EM	End of medium
26	00011010	SUB	Substitution
27	00011011	ESC	Escape
28	00011100	FS	Figures shift
29	00011101	GS	Group separator
30	00011110	RS	Record separator
31	00011111	US	Unit Separator
32	00100000	SP	Spacebar/ blank space