CODE CONVERSION

Object: To consider various important codes and the logic for converting from one to another.

Theory:

As we know, decimal, octal, and hexadecimal numbers can be represented by binary digits. Not only numbers, but letters and other symbols, can be represented by 1's and 0's.

In fact, any entity expressible as numbers, letters, or other symbols can be represented by binary digits, and therefore can be processed by digital logic circuits.

Combination of binary digits that represent numbers, letters, or symbols are digital codes. In many applications special codes are used for such auxiliary functions as error detection.

BCD code:

To code the ten decimal digits, ten unique symbols consisting of the binary digits 0&1are needed. A code of this type, which represents the decimal digits with binary digits, is called a binary- coded decimal, or BCD. There are several such codes in use. The BCD code of a decimal number of more than one digit is obtained by replacing each digit by it's4 -bit BCD code. In general, any binary code used to represent the decimal digit is called BCD. Table below shows the most general binary codes.

Procedure:

1-Design a logic circuit to convert BCD code to EX-3code using NAND gates only.

2-Use K-map to design a logic circuit to convert from 5421 code to 8421 code using NAND gates to check the logic design.

3-Design a logic circuit to obtain a Gray code from a BCD code using proper logic gates.

Decimal	Weighted codes				Unweighted code	
	8 4 2 1	2 4 2 1	5 2 1 1	7 4 2 1	Ex-3	Gray
0	0000	0000	0000	0000	0011	0000
1	0001	0001	0001	0001	0100	0001
2	0010	0010	0100	0010	0101	0011
3	0011	0011	0110	0011	0110	0010
4	0100	0100	0111	0100	0111	0110
5	0101	1011	1000	0101	1000	0111
6	0110	1100	1001	0110	1001	0101
7	0111	1101	1011	1000	1010	0100
8	1000	1110	1110	1001	1011	1100
9	1001	1111	1111	1010	1100	1101

Table (3.1) Binary codes

Discussion:

1. Convert each Gray code to binary:

a.1010 b.00010 c.11000010001

2. Convert each EX-3 code number to decimal:

a.0011 b.1001 c.10000101

3. Design a logic circuit with an output (F) and four bit input A, B, C&D. The output (F=1) when the input is BCD number and (F=0) otherwise.

4. Design a logic circuit which converts a BCD code to 6311 code using NAND gates only.