G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
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(Recognized by UGC under 2(f) and 12(B) & ISO 9001:2008 Certified Institution)
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Department of Electronics and Communication Engineering

Bridge Course
On
Computer Organization

Number Systems:

1) Binary Number system: Digits used are 0,2. Base of this system is 2.
2) Decimal Number System: Digits used are 0,1,2,3,4,5,6,7,8,9. Base of the system is 10.
3) Octal Number System: Digits used are 0,1,2,3,4,5,6,7. Base of the system is 8.
4) Hexa Decimal Number System: Digits used are 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F. Base of the system is 16.

Hex	Decimal	Octal	Binary
0	0	0	0
1	1	1	1
2	2	2	10
3	3	3	11
4	4	4	100
5	5	5	101
6	6	6	110
7	7	7	111
8	8	10	1000
9	9	11	1001
A	10	12	1010
B	11	13	1011
C	12	14	1100
D	13	15	1101
E	14	16	1110
F	15	17	1111
10	16	20	10000

Number Conversions:

1) Octal to Decimal

Eg: Convert $(125)_8 = (\ )_{10}$

$1X8^2+2X8^1+5X8^0 = 64 + 16 +5 = 85_{10}$

2) Hex to Decimal

Eg: Convert $(1A3)_{16} = (\ )_{10}$

$1X16^2+AX16^1+3X16^0 = 256 + 160 +3 = 419_{10}$

3) Binary to Decimal

Eg: Convert $(10111)_2 = (\ )_{10}$

$1X2^4+0X2^3+1X2^2+1X2^1+1X2^0 = 16+ 0+4+2+1 =23$

4) Decimal to Binary

Eg: Convert $(395)_{10} = (\ )_2$

$$\begin{array}{l} 2)395 \\ \hline 2)197-1 \\ \hline 2)98-1 \\ \hline 2)49-0 \\ \hline 2)24-1 \\ \hline 2)12-0 \\ \hline 2)6-0 \\ \hline 2)3-0 \\ \hline 2)1-1 \\ \hline \end{array}$$

$(110001011)_2$

5) Decimal to Octal

Eg: Convert $(395)_{10} = (\ )_8$

$$\begin{array}{l} 8)395 \\ \hline 8)49-3 \\ \hline 8)6-1 \\ \hline \end{array}$$

$=(613)_8$

6) Decimal to Hex

Eg: Convert $(1029)_{10} = (\ )_{16}$

$$\begin{array}{l} 16)1029 \\ \hline 16)64-5 \\ \hline 16)4-0 \end{array}$$

$= (405)_{16}$

7) Binary to Octal

Eg: Convert $(10110111101)_2 = (\ )_8$

$= 10\ 110\ 111\ 101 = (2675)_8$

8) Binary to Hex

Eg: Convert (1011011110110)2 = ( )16

$= 1\ 0110\ 1111\ 0110 = (16F6)_{16}$

1’s Complement:

Subtract the given number from all 1s or flip 1 to 0 and 0 to 1.

Eg: Find 1’s complement of 11001_2

```
 11111
 11001
______
 00110
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1’s complement is used to store the negative numbers. Disadvantage of this system is +0 and -0 are having different values.

2’s Complement:

Find 1’s complement of the given number and add 1 to the answer.

Eg: Find 2’s complement of 11001_2

1’s complement of 11001 is 00110 +1 = 00111.

In this system +0 and -0 are having same representation. Hence 2’s complement is used to store the –ve numbers in memory.

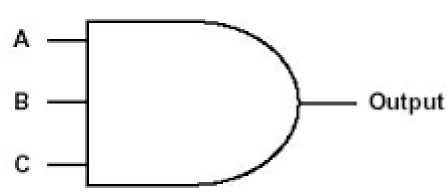
Floating Point Numbers

Logic Gates:

AND GATE

A	B	C	Y
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

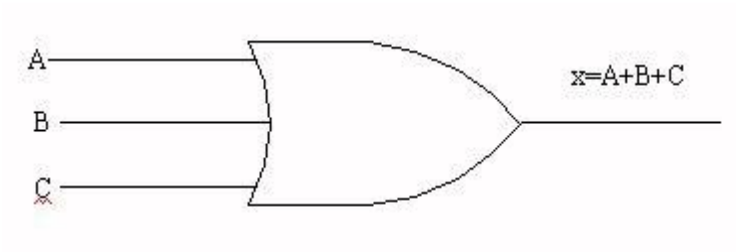
Y= ABC



OR GATE

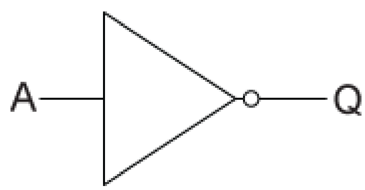
A	B	C	X
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

X= A+B+C



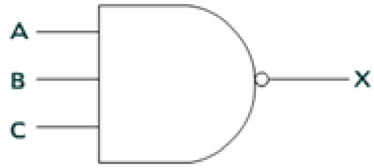
NOT GATE

A	Q
0	1
1	0



NAND GATE

A	B	C	X
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1



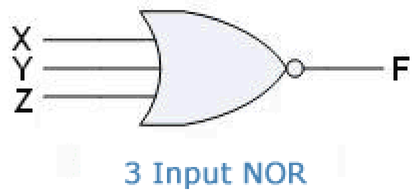
1	1	1	0

X=(ABC)’

NOR GATE

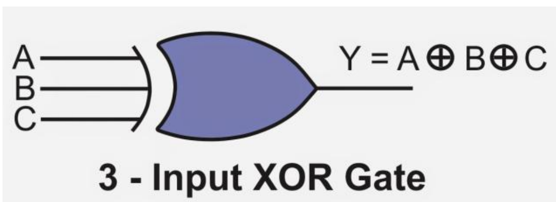
A	B	C	F
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

F=(A+B+C)’



XOR GATE

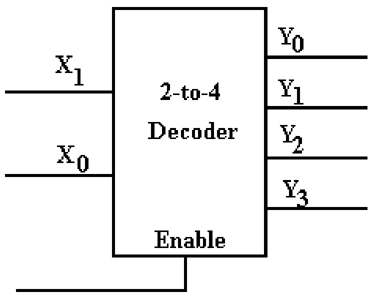
A	B	C	Y
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

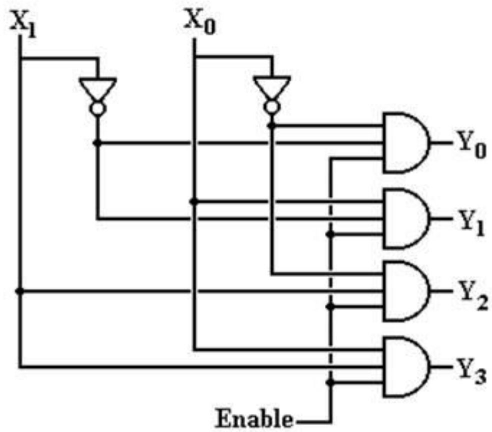


Combinational Circuits:

1. Decoder : It will have n inputs and 2n outputs. Out of all outputs only one will be selected.

   2 to 4 Decoder

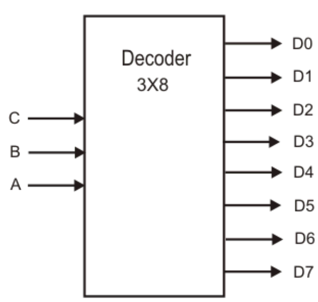


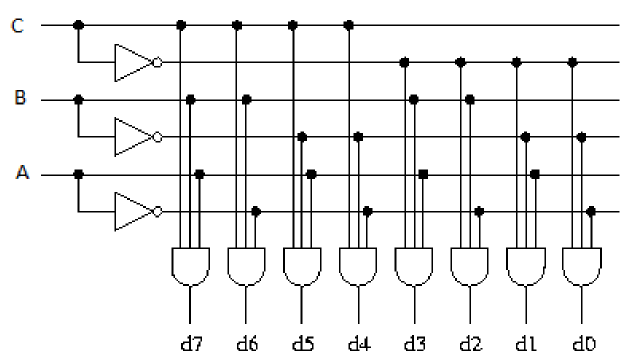


Truth Table

X1	X0	Y3	Y2	Y1	Y0
0	0	0	0	0	1
0	1	0	0	1	0
1	0	0	1	0	0
1	1	1	0	0	0

3 to 8 Decoder

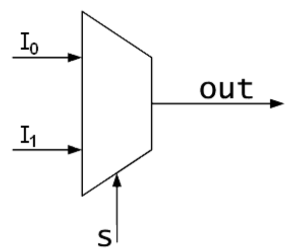


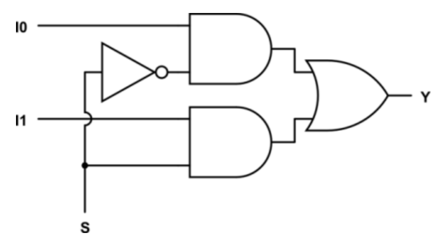


C	B	A	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	1	0	0
0	1	1	0	0	0	0	1	0	0	0
1	0	0	0	0	0	1	0	0	0	0
1	0	1	0	0	1	0	0	0	0	0
1	1	0	0	1	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0

Multiplexer

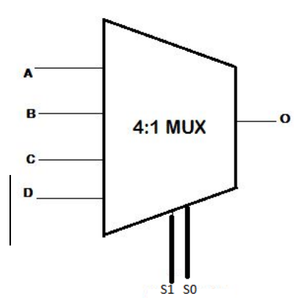
2:1 MUX





S	Out
0	I_0
1	I_1

4:1 Mux



Truth

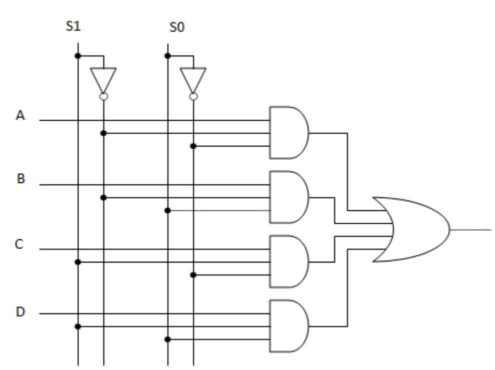
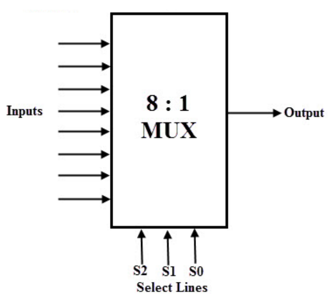
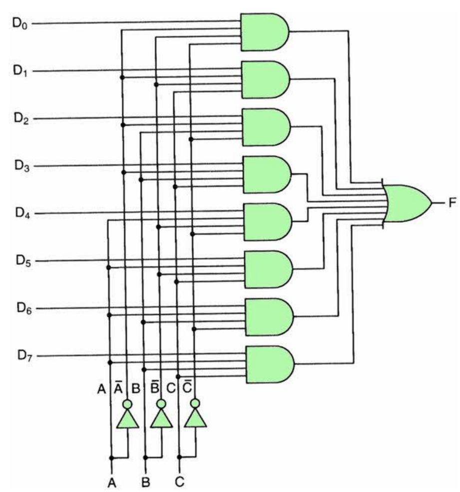


Table:

0	0	A
0	1	B
1	0	C
1	1	D

8:1 Mux





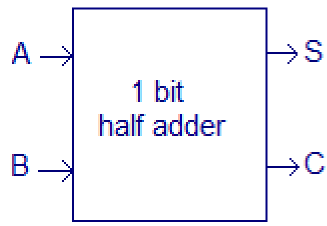
Truth Table

S2	S1	S0	O
0	0	0	I0
0	0	1	I1
0	1	0	I2
0	1	1	I3
1	0	0	I4
1	0	1	I5
1	1	0	I6
1	1	1	I7

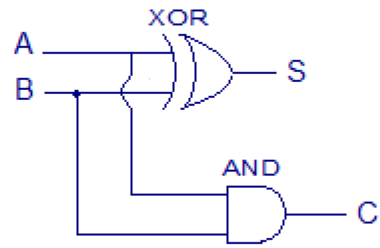
Half Adder

Inputs		Outputs	
A	B	S	C
0	0	0	0
1	0	1	0
0	1	1	0
1	1	0	1

Truth table

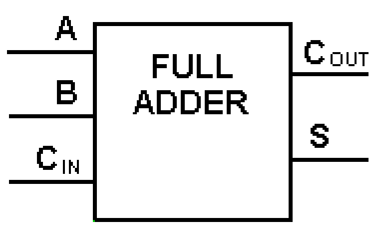


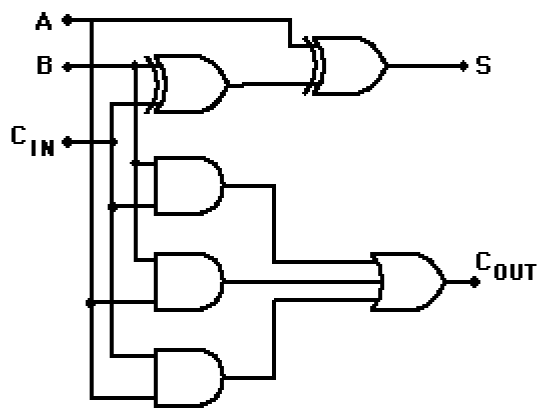
Schematic



Realization

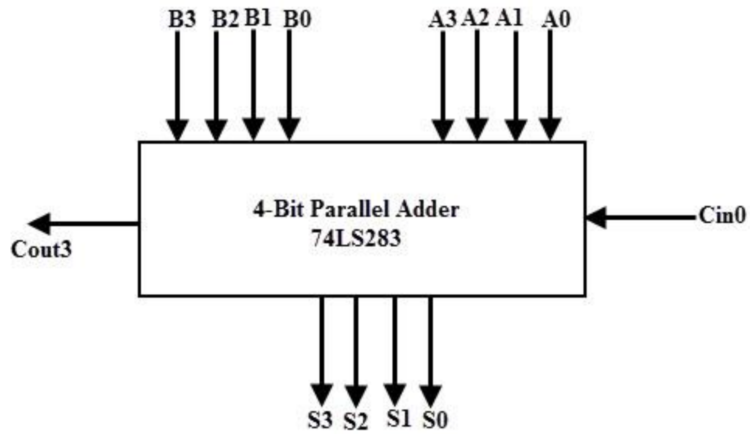
Full Adder



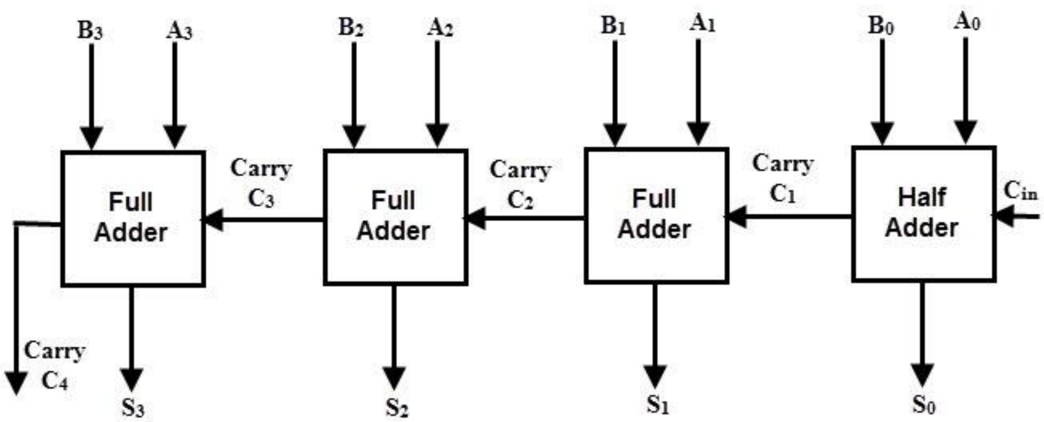


Input			Output	
A	B	Cin	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

4bit Adder



B3
B2
B1
B0
A3
A2
A1
A0
4-Bit Parallel Adder
74LS283
Cin0
Cout3
S3
S2
S1
S0



B3
A3
B2
A2
B1
A1
B0
A0
Full Adder
Carry C3
Full Adder
Carry C2
Full Adder
Carry C1
Half Adder
Cin
Carry C4
S3
S2
S1
S0