CMOS

CMOS:-

MOSFET's are two types

1. N channel mosfet
2. P channel mosfet

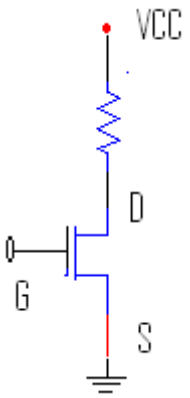

Figure 6.14

It is used a on off condition switch. If the voltage at gate is more than the source voltage then it is called as on switch

If the gate voltage is less than the source voltage then it is simply acts as a off switch

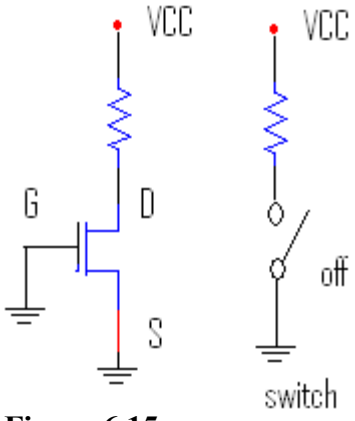

Figure 6.15

CMOS INVERTER

In MOSFET the source and drain can be interchanged. CMOS means complementary metal oxide semi conduction, complementary it contains both P channel MOSFET & N channel

MOSFET, if P channel is in off condition then N channel is in on state & vice versa, P channel MOSFET are called as pull up transistor

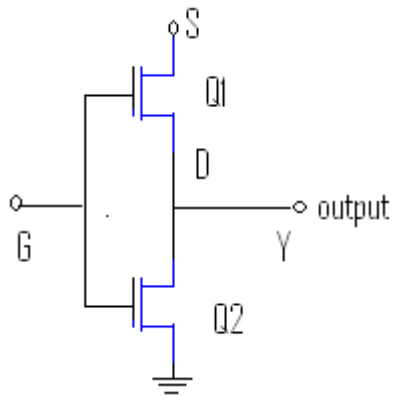

Figure 6.16

V_{CC} is applied to the MOSFET. Bcoz it pulls the output to the high level.

When A = 1, Q_1 is OFF, & Q_2 is ON, the output is pulled to low level, the output is directly connected to ground with ON resistance of Q_2, output, Y = 0.

When A = 0, Q_1 is ON, & Q_2 is OFF then Y = 1 (since output is pulled up to high level through ON resistance

The ON resistance of any transistor i.e, CMOS transistor is low when logic output is zero when compared to the logic output high (Q_1 is more than Q_2)

CMOS NAND gate:

Q_1 & Q_2 are P channel MOSFETS → pull up transistors

Q_3 & Q_4 are N channel MOSFETS → pull down transistors

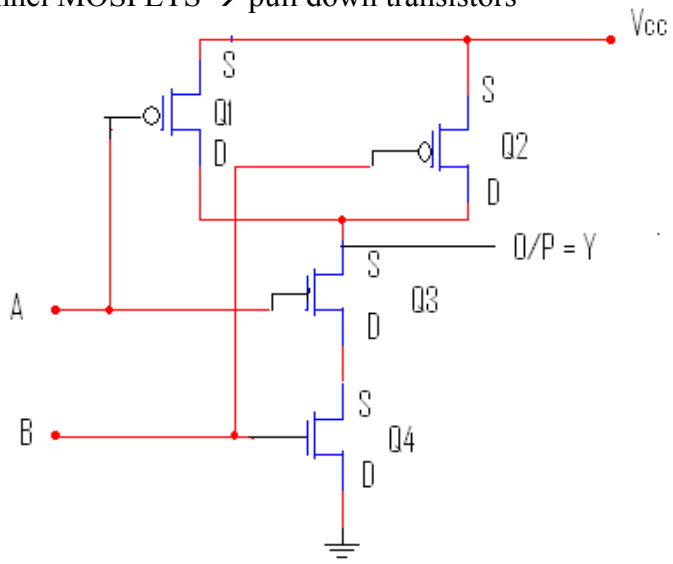

Figure 6.17

A	B	Q_1	Q_2	Q_3	Q_4	OUTPUT
0	0	ON	ON	OFF	OFF	HIGH
0	1	ON	OFF	OFF	ON	HIGH
1	0	OFF	ON	ON	OFF	HIGH
1	1	OFF	OFF	ON	ON	HIGH

When the both inputs are low the both the transistor Q_1,Q_2 is in ON state & Q_3 & Q_4 is in OFF state then the output is pulled up to high level through the ON resistance of Q_1 & Q_2 in parallel. For the data inputs A = 0 & B = 1 the transistor Q_1,$Q_4$is in ON state & Q_2,Q_3 are in OFF state then the output is pulled up to high level through the ON resistance of Q_1.

When the data output's are A = 1 & B = 0 then the transistor Q_2,$Q_3$is in ON state & Q_1,Q_4 are in OFF state then the output is pulled up to high level through the ON resistance of Q_2.

For the data A = 1 & B = 1 the transistor Q_1, $Q_2$is in OFF state & Q_3, Q_4 are in ON state. Therefore the output is directly connected to ground with the ON resistance of Q_3,Q_4 in series so output is low.