FACULTY OF ENGINEERING & TECHNOLOGY

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Multiplexers

A multiplexer (MUX) also known as data selector, is a logic circuit which allows the digital information from multi-inputs to a single output line. The selection of the input data to be routed to the output line is done by the select terminals. The number of select terminals depends on the number of input lines to be routed to output line, given by the general formula as:
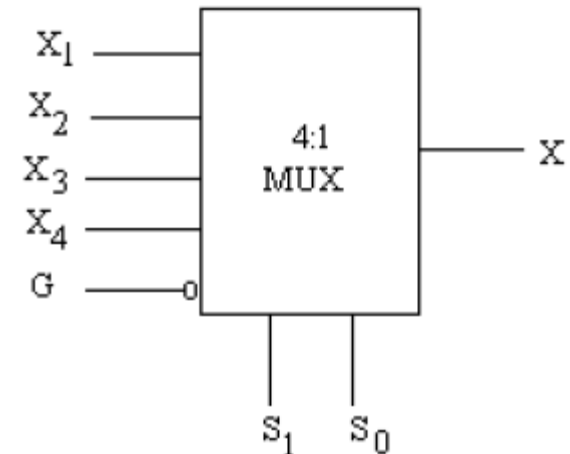
$$2^K=N$$

where N is the number of input lines
        K is the number of select terminals.

Example. if there are 4 input lines to be routed to output line, then two select terminals are needed as $2^2=4$.

The output X will follow the input data depending on the select terminals S_1, S_0 ,as given in the table

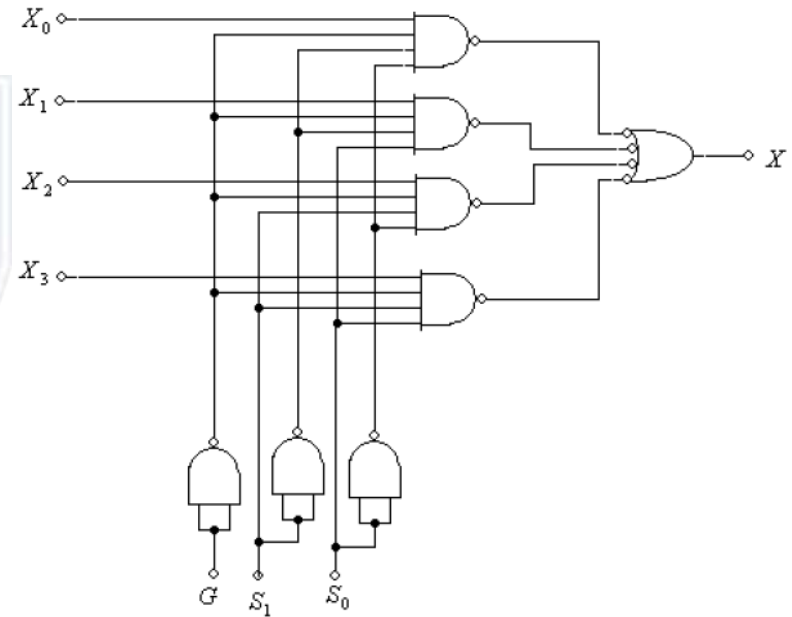| Select terminals		Output
S_1	S_0	X
0	0	$X=X_0$
0	1	$X=X_1$
1	0	$X=X_2$
1	1	$X=X_3$

The block diagram for 4:1 multiplexer

The Boolean function to perform the multiplexing action is given as:

$$X = X_0 \cdot \overline{S}_1 \cdot \overline{S}_0 + X_1 \cdot \overline{S}_1 \cdot S_0 + X_2 \cdot S_1 \cdot \overline{S}_0 + X_3 \cdot S_1 \cdot S_0$$

Q 2: Use Multiplexers to implement of Full adder

Demultiplexers

A demultiplexer performs the reverse process of multiplexer; it receives the information on a single line and steers to several output lines. Demultiplexer can also be called the Data Distributor as it can transmit the same data to the different lines. It transmits the data to 2^N output lines, for which the select terminals of N bits are required.

Example. To transmit the single data to four output lines (1:4 DMUX), select terminals of two bits are required

If S_1,S_0 = 00 , the input data X will be go to the output X_0
If S_1,S_0 = 01 , the input data X will be go to the output X_1
If S_1,S_0 = 10 , the input data X will be go to the output X_2
If S_1,S_0 = 11 , the input data X will be go to the output X_3

The Boolean expressions for X0, X1, X2, X3 are given by:

$$X_0 = X \cdot \overline{S}_1 \cdot \overline{S}_0$$

$$X_1 = X \cdot \overline{S}_1 \cdot S_0$$

$$X_2 = X \cdot S_1 \cdot \overline{S}_0$$

$$X_3 = X \cdot S_1 \cdot S_0$$