Experiment No. : 07

Aim - Implementation of 4x1 Multiplexer and 1x4 Demultiplexer using logic gates

Objective:

To analyse the truth table and working of 1x4 De-Multiplexer by using 3-input NAND and 1-input NOT logic gate ICs and 4x1 Multiplexer by using 3-input AND, 3-input OR, and 1-input NOT logic gate ICs.

Theory

Introduction

The function of a multiplexer is to select the input of any 'n' input lines and feed that to one output line. The function of a de-multiplexer is to inverse the function of the multiplexer and the shortcut forms of the multiplexer. The de-multiplexers are mux and demux. Some multiplexers perform both multiplexing and de-multiplexing operations.

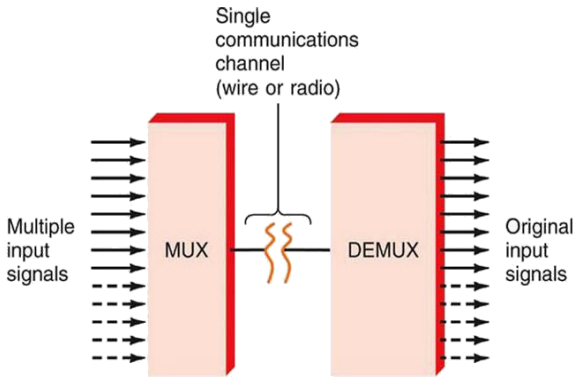

Figure-1: Block diagram of Multiplexer and De-multiplexer

1) Multiplexer

Multiplexer is a device that has multiple inputs and a single line output. The select lines determine which input is connected to the output, and also to increase the amount of data that can be sent over a network within certain time. It is also called a data selector.

Multiplexers are classified into four types:

a) 2-1 multiplexer (1 select line)
b) 4-1 multiplexer (2 select lines)
c) 8-1 multiplexer(3 select lines)
d) 16-1 multiplexer (4 select lines)

1.1) 4x1 Multiplexer

4x1 Multiplexer has four data inputs I3, I2, I1 & I0, two selection lines S1 & S0 and one output Y. The block diagram of 4x1 Multiplexer is shown in the following figure.One of these 4 inputs will be connected to the output based on the combination of inputs present at these two selection lines. Truth table of 4x1 Multiplexer is shown below.

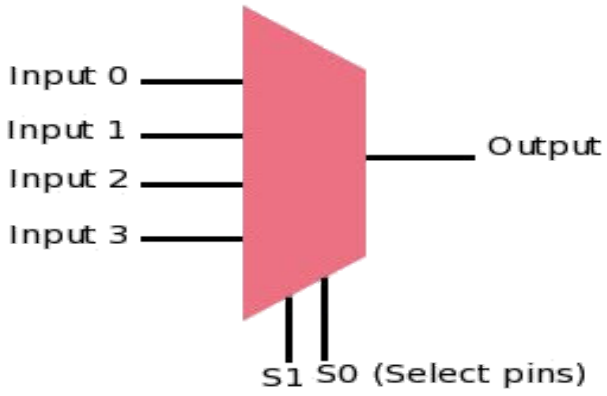

Figure-2:Block diagram of 4x1 Multiplexer

Selection Lines		Output
S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

Figure-3:Truth table of 4x1 Multiplexer

2) De-multiplexer

De-multiplexer is also a device with one input and multiple output lines. It is used to send a signal to one of the many devices. The main difference between a multiplexer and a de-multiplexer is that a multiplexer takes two or more signals and encodes them on a wire, whereas a de-multiplexer does reverse to what the multiplexer does.

De-multiplexer are classified into four types:

a)1-2 demultiplexer (1 select line)
b)1-4 demultiplexer (2 select lines)
c)1-8 demultiplexer (3 select lines)
d)1-16 demultiplexer (4 select lines)

1x4 De-multiplexer –

1x4 De-Multiplexer has one input I, two selection lines, S1 & S0 and four outputs Y3, Y2, Y1 & Y0. The block diagram of 1x4 De-Multiplexer is shown in the following figure.

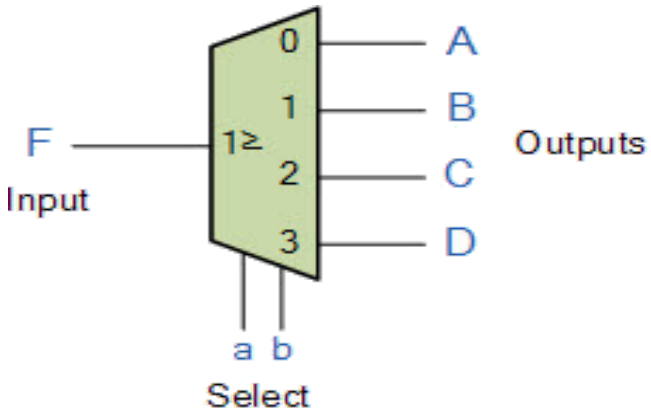

Figure-4:Block diagram of 1x4 De-Multiplexer

Selection Inputs		Outputs			
S_1	S_0	Y_3	Y_2	Y_1	Y_0
0	0	0	0	0	I
0	1	0	0	I	0
1	0	0	I	0	0
1	1	I	0	0	0

Figure-5:Truth table of 1x4 De-Multiplexer

Procedure -

1) 4x1 Multiplexer

Step-1) Connect the supply(+5V)  to the circuit.
Step-2) First press "ADD" button to add basic state of your output in the given table.
Step-3) Press the switches "S0" and "S1"to select the desired input line.
Step-4) Press "ADD" button to add your inputs and outputs in the given table.
Step-5) Repeat step 3 and step 4 for next state of inputs and their corresponding outputs.
Step-6) Press the "PRINT" button after completing your simulation to get your results.

2) 1x4 De-Multiplexer

Step-1) Connect the supply(+5V)  to the circuit.
Step-2) First press "ADD" button to add basic state of your output in the given table.
Step-3) Press the switch "A" for Input.
Step-4) Press switches "B" and "C" to select the desired input line.
Step-5) Press "ADD" button to add your inputs and outputs in the given table.
Step-6) Repeat step 4 and step 5 for next state of inputs and their corresponding outputs.
Step-7) Press the "PRINT" button after completing your simulation to get your results.