Circuit Simulation Project

https://esim.fossee.in/circuit-simulation-project

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Title of the circuit: Illustration of 1:2 DeMUX using logic gates

Theory/ Description:

A demultiplexer performs the reverse operation of a multiplexer (which takes several inputs and transmits one of them to the object). The DeMUX takes a single input and distributes it over several outputs. So, a DeMUX can be thought of as a 'distributor', since it transmits the same data to different destinations. Thus, a DeMUX is a 1-to-N device. Fig. 1 shows the functional block diagram of a DeMUX. The demultiplexer takes one input data source and selectively distributes it to 1-to-N output channels just like a multi-position switch.

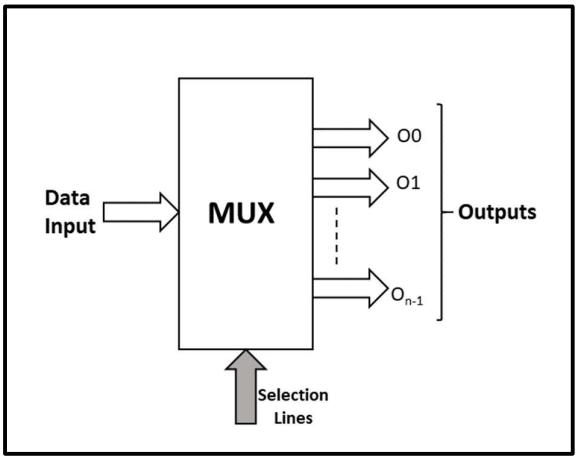


Fig. 1 – Functional Block Diagram of DeMUX

The input data line goes to all of the AND gates. The selection lines enable only one gate at a time and the data appearing on the input line will pass through the selected gate to associated output line. The **truth table** for 1:2 DeMUX is:

Table 1: Truth Table of 1:2 DeMUX

S	D	Y1	Y0
0	0	0	0
0	1	0	1
1	0	0	0
1	1	1	0

where S = selection line; D is the data input line; and Y0 and Y1 are output lines.

The input is routed to Y0 and Y1 depending on the value of select input S.

Expression of a typical 1:2 DeMUX is as follows

$$\mathbf{Y0 = \overline{S}D}$$

$$\mathbf{Y1 = SD}$$

The circuit diagram of 1:2 DeMUX is shown in fig. 2. The logic gates from the above expression which are used are AND, and OR gates and an invertor (NOT) gate.

Demultiplexers are used to select or enable the one signal out of many, these are extensively used in microprocessors, also in synchronous data transmission systems, data acquisition systems, combination circuits, etc.

Circuit Diagram(s):

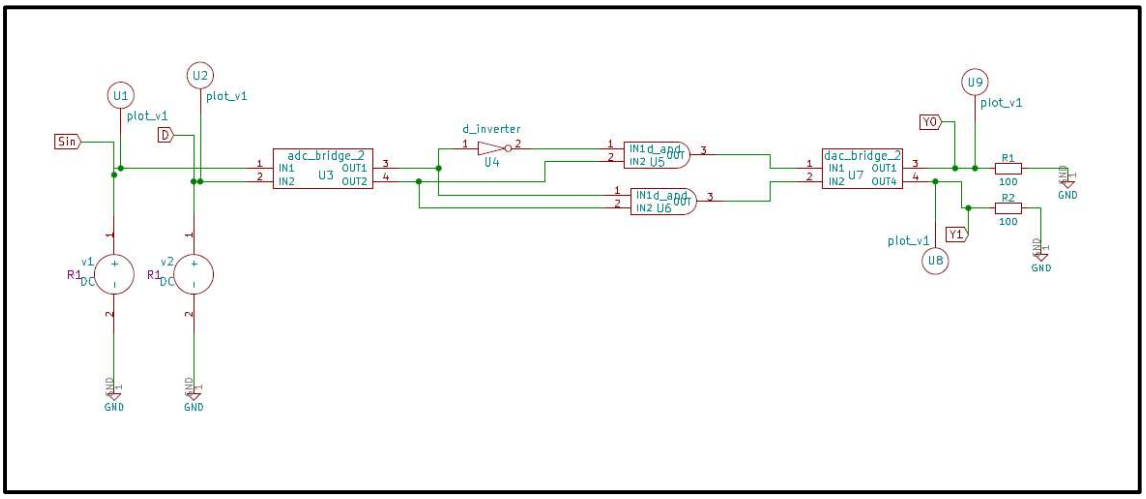
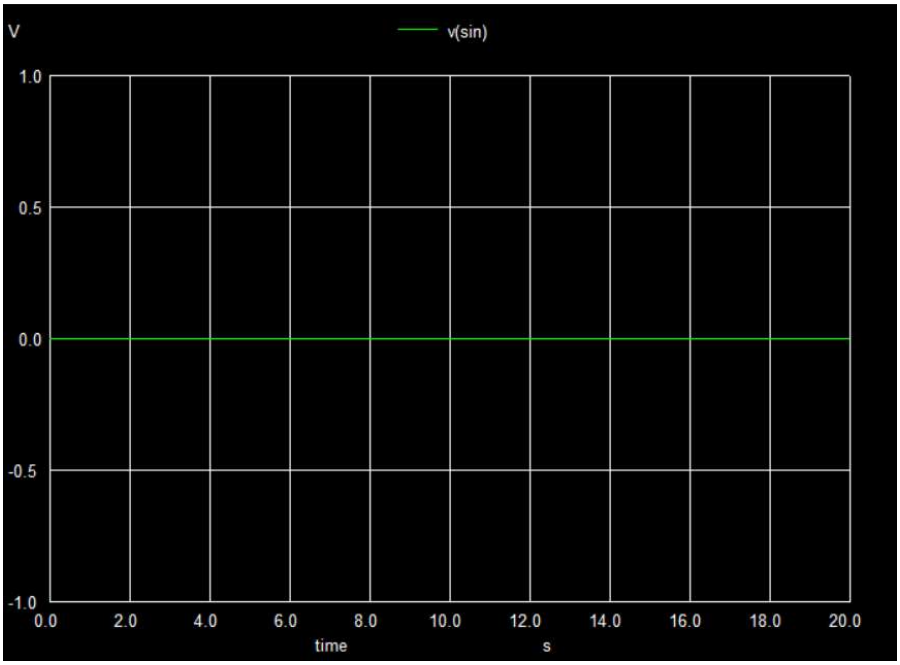


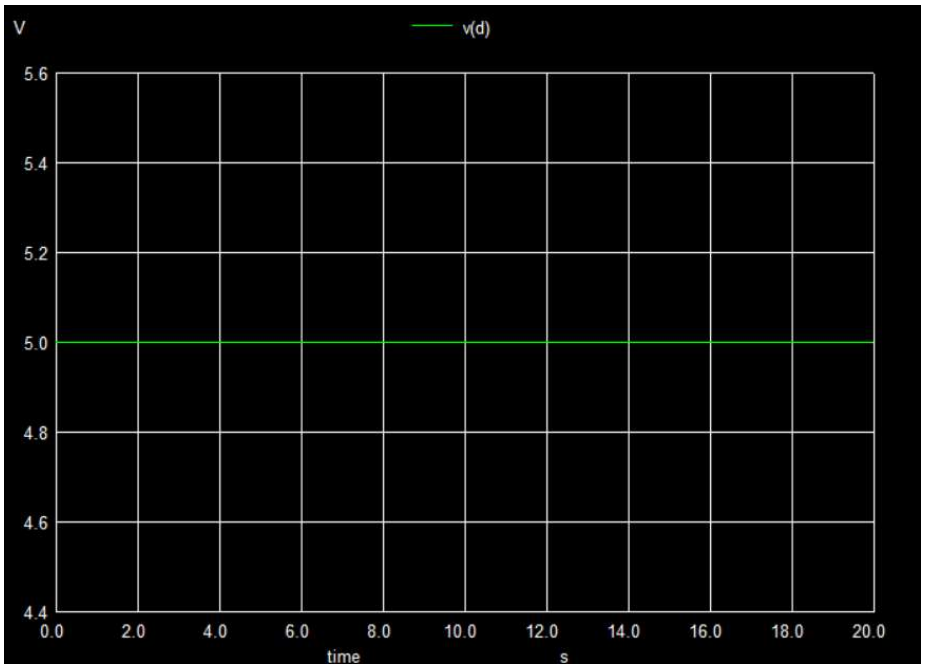
Fig. 2 – Circuit diagram of 1:2 DeMUX using Logic Gates

Results (Input, Output waveforms and/or Multimeter readings):

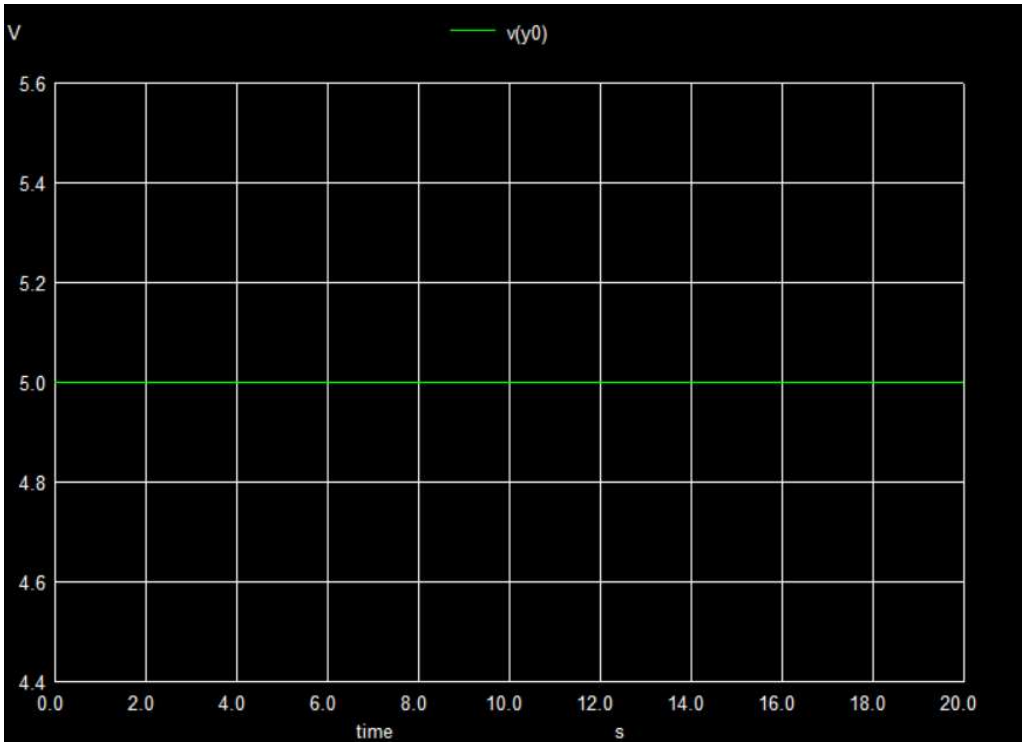
1. Selection line – S_{in} = 0



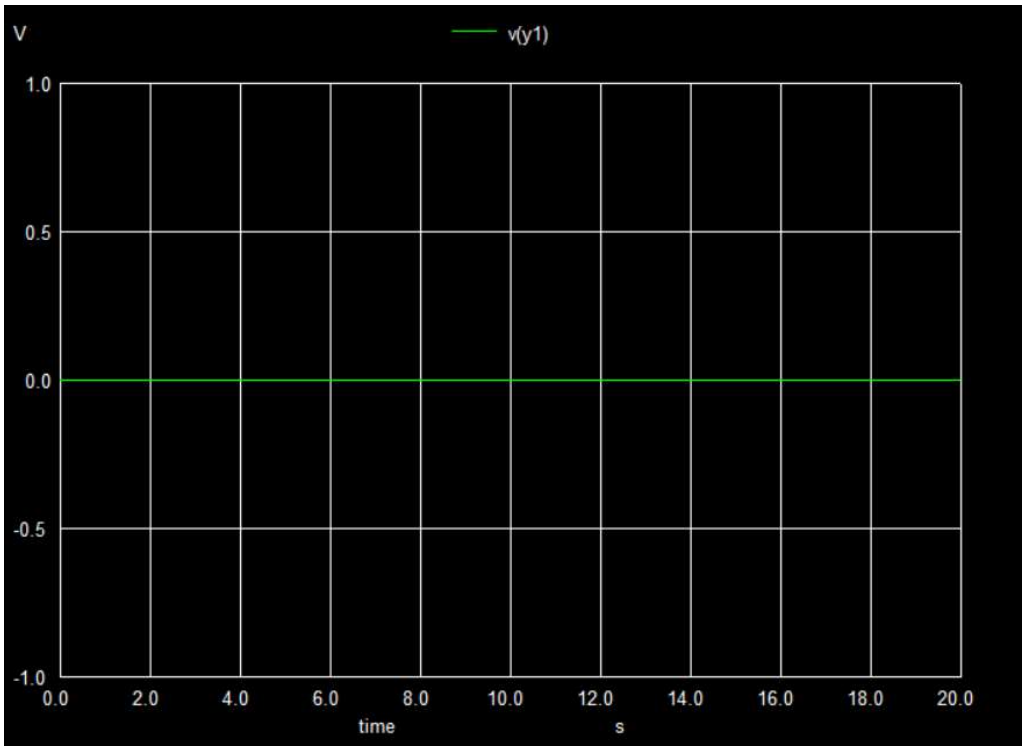
2. Data input – D = 5V (DC)



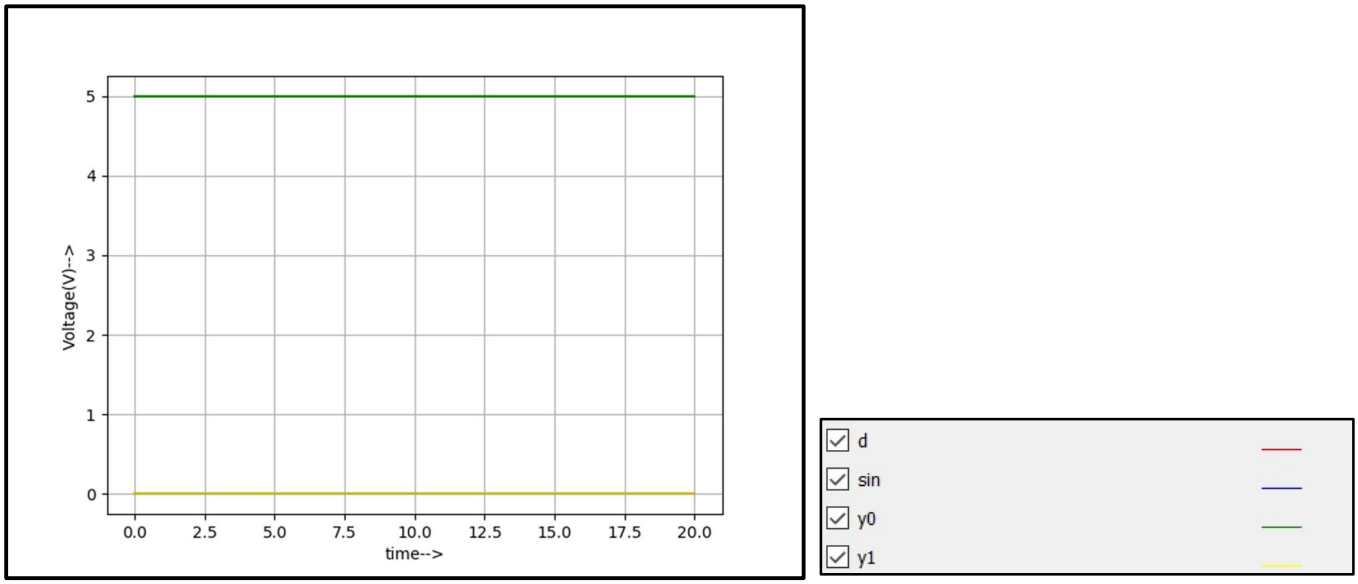
3. Output – Y0 = 5V



4. Output – Y1 = 0V



Python Plot:



Source/Reference(s):

1. https://www.electronicshub.org/demultiplexerdemux/#1-to-2_Demultiplexer
2. Digital Circuits by Anand Kumar book.
3. Digital logic o& computer design by M Morris Mano book.