

# DIGITAL ELECTRONICS LAB

## EXPERIMENT – 3

*PULKIT PANDEY*

*2K19/EP/076*

**AIM:** To study and verify the operations of 3 to 8 line decoder and 4 to 1 line multiplexer (74138, 74153)

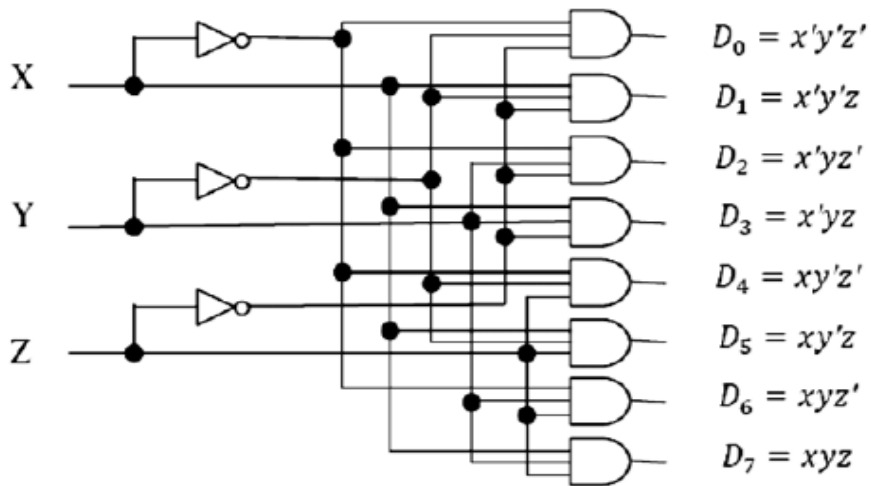
### **THEORY:**

#### **DECODER**

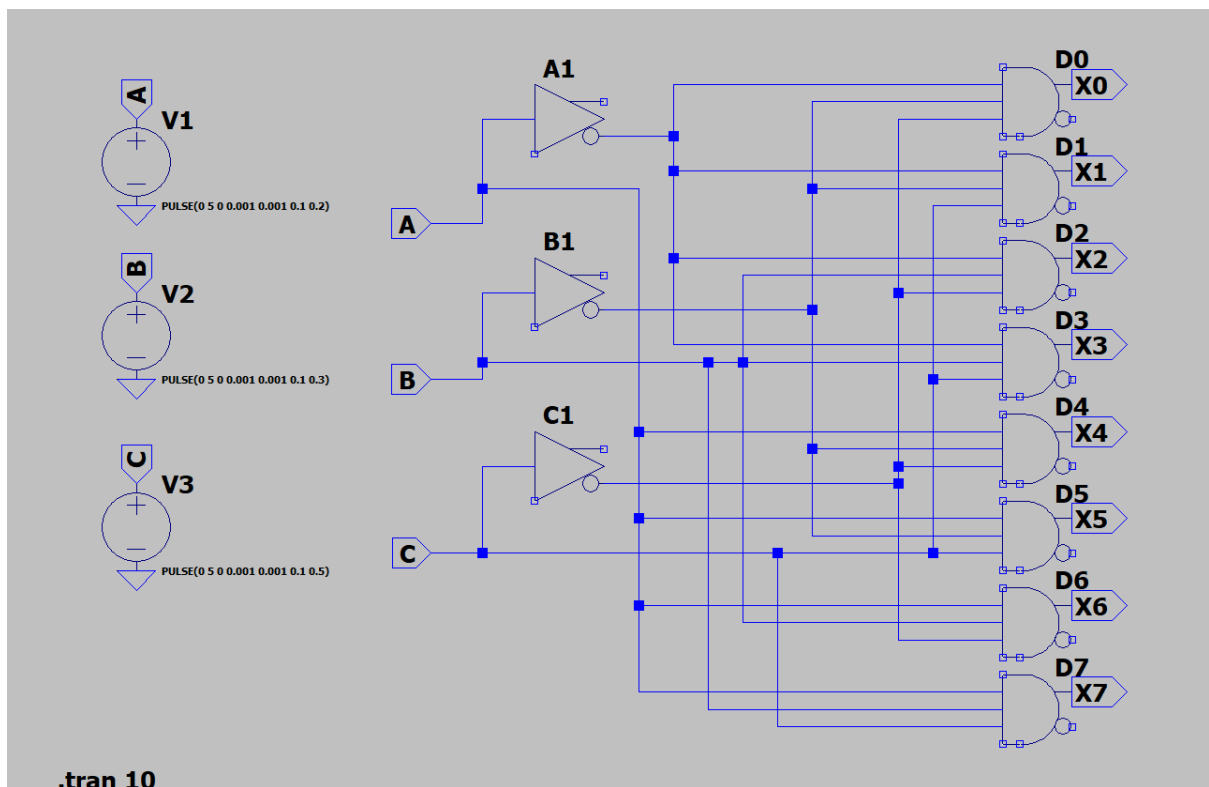
In digital electronics, a decoder can take the form of a multiple-input, multiple-output logic circuit that converts coded inputs into coded outputs, where the number of inputs is less than the number of outputs e.g.  $n$ -to- $2^n$ , binary-coded decimal decoders. Decoding is necessary in applications such as data multiplexing, 7 segment display and memory address decoding.  $n$ -to- $2^n$  type binary decoders are combinational circuits that convert binary information from ' $n$ ' coded inputs to a maximum of  $2^n$  unique outputs. In case the ' $n$ ' bit coded information has unused bit combinations, the decoder may have less than  $2^n$  outputs. 2-to-4 decoder, 3-to-8 decoder or 4-to-16 decoder are examples of  $n$ -to- $2^n$  decoders. The input to a decoder is parallel binary number and it is used to detect the presence of a particular binary number at the input. The output indicates presence or absence of specific number at the decoder input. A 3-to-8 line decoder has 3 input lines and 8 output lines. It is also called as binary to octal decoder it takes a 3-bit binary input code and activates one of the 8(octal) outputs corresponding to that code.

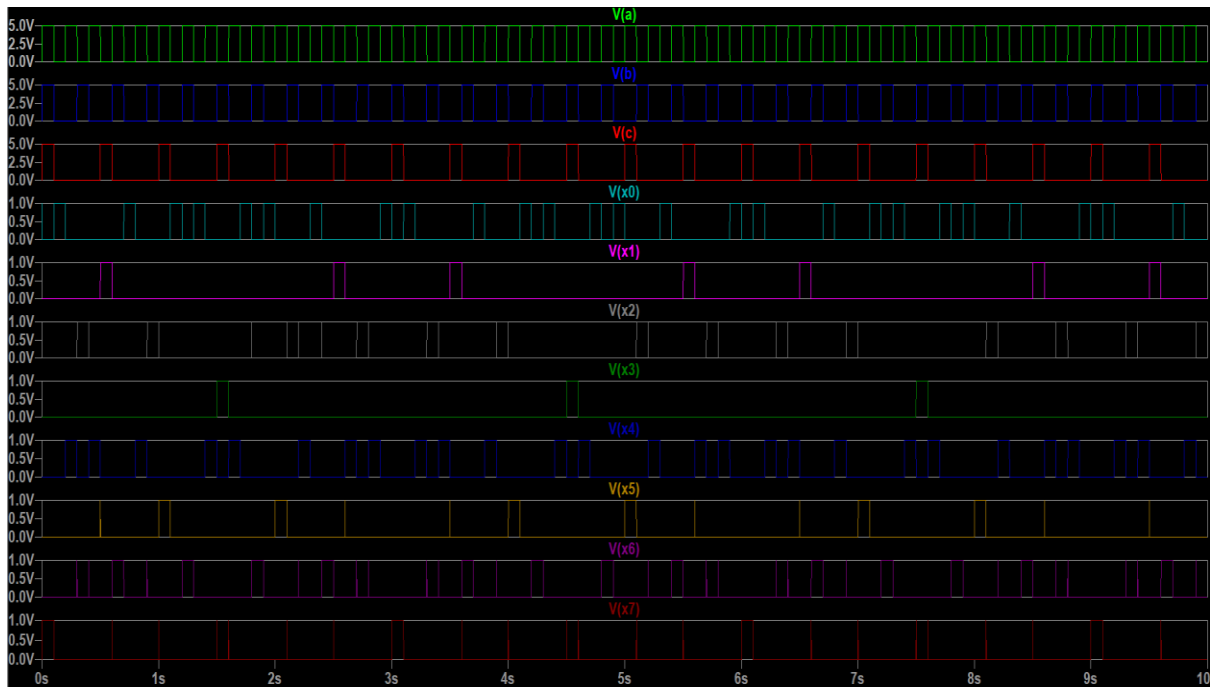
**Truth Table and Circuit Diagram:**

$A_2$	$A_1$	$A_0$	$D_7$	$D_6$	$D_5$	$D_4$	$D_3$	$D_2$	$D_1$	$D_0$
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



### Software Simulations:



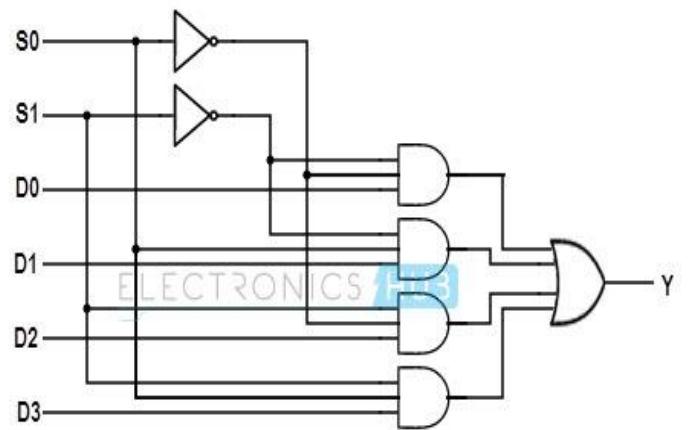


## MULTIPLEXER:

In digital electronics, a multiplexer or mux is a device that selects one of several analog or digital input signals and forwards the selected input into a single line. A multiplexer of  $2^n$  inputs has  $n$  select lines, which are used to select which input line to send to the output. An electronic multiplexer can be considered as a multiple-input, single-output switch i.e. digitally controlled multi-position switch. The digital code applied at the select inputs determines which data inputs will be switched to output. A common example of multiplexing or sharing occurs when several peripheral devices share a single transmission line or bus to communicate with computer. Each device in succession is allocated a brief time to send and receive data. At any given time, one and only one device is using the line. This is an example of time multiplexing since each device is given a specific time interval to use the line. In frequency multiplexing, several devices share a common line by transmitting at different frequencies. A 4-to-1 line multiplexer has 4 input lines and a single output line. It takes 4 inputs and uses 2 'select' bits to determine which input bit is obtained at the output.

**Truth Table and Circuit Diagram:**

Select Data Inputs		Output
$S_1$	$S_0$	$Y$
0	0	$D_0$
0	1	$D_1$
1	0	$D_2$
1	1	$D_3$



### Software Simulations:

