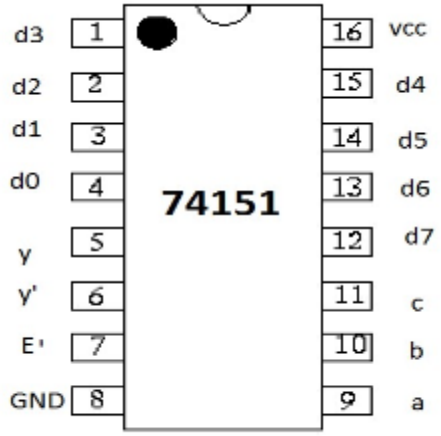
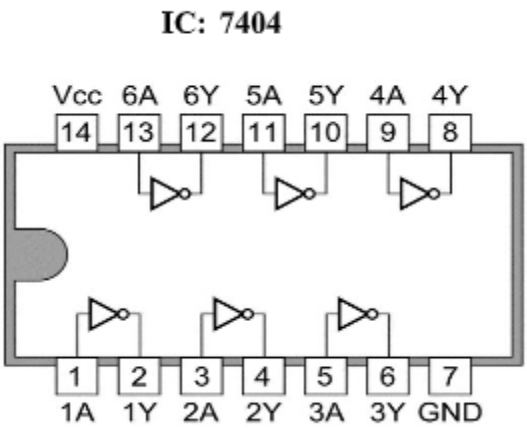
3. Given a 4-variable logic expression, simplify it using appropriate technique and realize the simplified logic expression using 8:1 multiplexer IC.

AIM: Given a 4-variable logic expression, simplify it using appropriate technique and realize the simplified logic expression using 8:1 multiplexer IC.

COMPONENTS REQUIRED: IC 74151,Hex-Inverter IC 7404,Digital Trainer Kit with + 5V dc power supply, Patch chords.

PIN CONFIGURATIONS:





THEORY:

The Multiplexer (Many-to-One)

In 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. Multiplexers are mainly used to increase the amount of data that can be sent over the network within a certain amount of time and bandwidth. A multiplexer is also called a data selector.

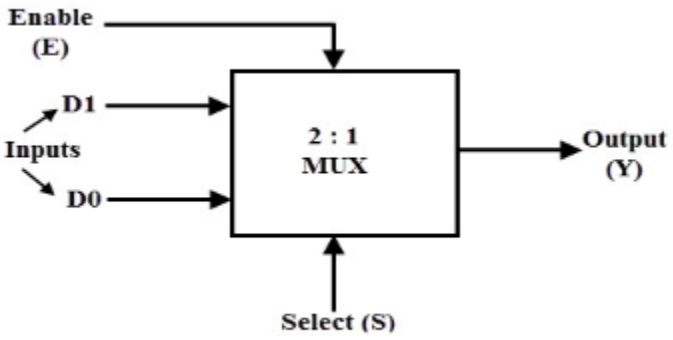


Figure 1:2:1 multiplexer

MAP ENTERED VARIABLE (MEV)

METHOD: Rules for entering values in a MEV

table is shown below.

Rule	MEV	Y	Entry in new Truth table	Explanation
1	0	0	0	If Y=0 for both values of MEV then enter 0 in appropriate cell of MEV Map.
	1	0		
2	0	1	1	If Y=1for both values of MEV then enter1in appropriate cell of MEV Map.
	1	1		
	0	0		If Y=(MEV) for both values of MEV then enter

3	1	1	(MEV)	that MEV in appropriate cell of MEV Map.
4	0	1	(MEV)'	If Y=(MEV)' for both values of MEV then enter that
	1	0		(MEV)' in appropriate cell of MEV Map.
5	0	X	X	If Y=X (don't care) for both values of MEV then
	1	X		Enter X in appropriate cell of MEV Map.
6	0	X	0	If Y =X (don't care) for MEV=0 and Y =0 for
	1	0		MEV=1, then enter 0 in appropriate cell of MEV Map.
7	0	0	0	If Y =0 for MEV=0 and Y =X(don't care) for
	1	X		MEV=1, then enter 0 in appropriate cell of MEV Map.
8	0	X	1	If Y =X (don't care) for MEV=0 and Y =1 for
	1	1		MEV=1, then enter 1 in appropriate cell of MEV Map.
9	0	1	1	If Y =1 for MEV=0 and Y = X (don't care) for
	1	X		MEV=1, then enter 1 in appropriate cell of MEV Map.

Expression :f(A,B,C,D)=∑m(2,3,4,5,13,14)+ dc(8,9,10,11)

TRUTH TABLE

Decimal	A	B	C	D	Y	MEV (D)
0	0	0	0	0	0	0
1	0	0	0	1	0	
2	0	0	1	0	1	1
3	0	0	1	1	1	
4	0	1	0	0	1	1
5	0	1	0	1	1	
6	0	1	1	0	0	0
7	0	1	1	1	0	
8	1	0	0	0	X	X
9	1	0	0	1	X	
10	1	0	1	0	X	X
11	1	0	1	1	X	
12	1	1	0	0	0	D
13	1	1	0	1	1	
14	1	1	1	0	1	$\overline{D}$
15	1	1	1	1	0	

Decimal	A	B	C	Y
0	0	0	0	0
1	0	0	1	1
2	0	1	0	1
3	0	1	1	0
4	1	0	0	X
5	1	0	1	X
6	1	1	0	D
7	1	1	1	$\overline{D}$

TRUTH TABLE FOR MEV 'D'

D0 = D3 = 0

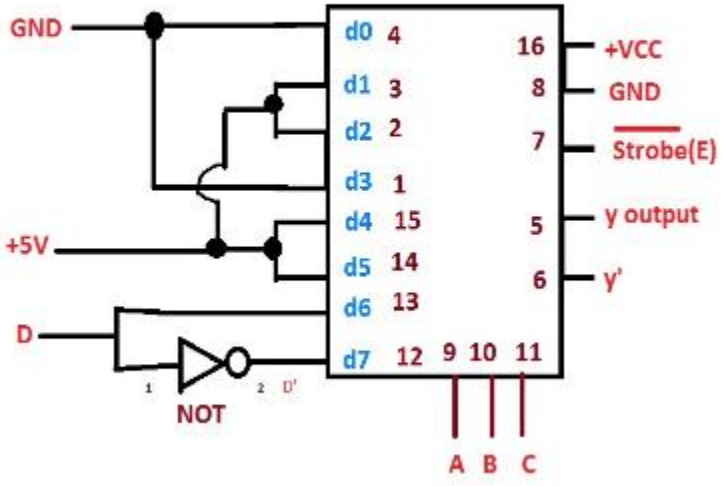
D1 = D2 = 1

D4 = D5 = X

D6 =D

D7 = D' output of NOT gate

CIRCUIT DIAGRAM:



Where in above truth table X (don't care) can be substituted by either 0 or 1. In circuit diagram we substituted X by 1.

PROCEDURE:

1. Verify all components and patch chords whether they are in good condition or not.
2. Make connection as shown in the circuit diagrams.
3. Give supply to the trainer kit.
4. Provide input data to circuit via switches.
5. Verify truth table for sequence of input and corresponding outputs.

Result:

The given four variables logical expression has been realized using 8:1 multiplexer IC and the truth table is verified.