Experiment No. 06

Name of the Experiment: To check the operation of 2-to-4 line Decoder.

Objective:

To learn about working principle of decoder. To learn and understand the working of IC 74LS139. To realize using basic gates as well as universal gates.

Components Required:

- IC74LS139, IC 7400, IC 7408, IC 7432, IC 7404, IC 7410.
- Patch chords.
- IC Trainer Kit.

Theory:

A decoder is a combinational circuit that connects the binary information from 'n' input lines to a maximum of 2 □ unique output lines. Decoder is also called a min-term generator/max-term generator. A min-term generator is constructed using AND and NOT gates. The appropriate output is indicated by logic 1 (positive logic). Max-term generator is constructed using NAND gates. The appropriate output is indicated by logic 0 (Negative logic). The IC 74139 accepts two binary inputs and when enable provides 4 individual active low outputs. The device has 2 enable inputs (Two active low).

▪ 2:4 DECODER (MIN TERM GENERATOR):

Truth Table:

INPUT		OUTPUT			
A	B	Y0	Y1	Y2	Y3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

Boolean Expression:

$$Y0 = \overline{A}\,\overline{B}$$
$$Y1 = \overline{A}B$$
$$Y2 = A\overline{B}$$
$$Y3 = AB$$

Circuit Diagram:

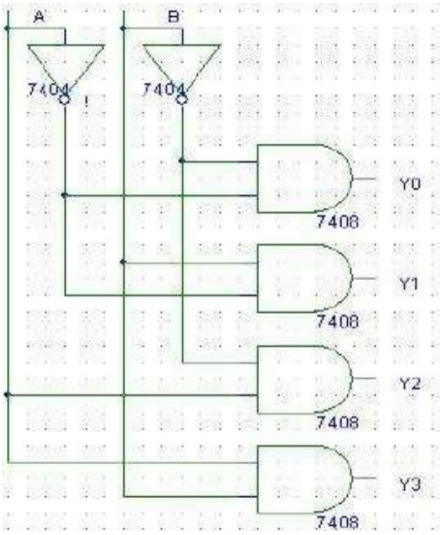
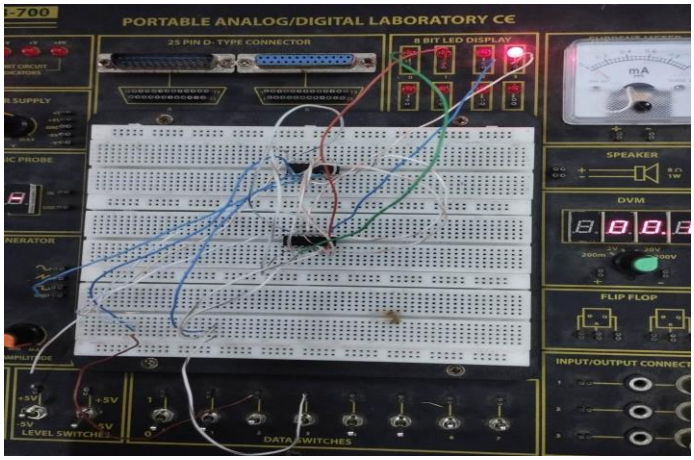


Diagram:

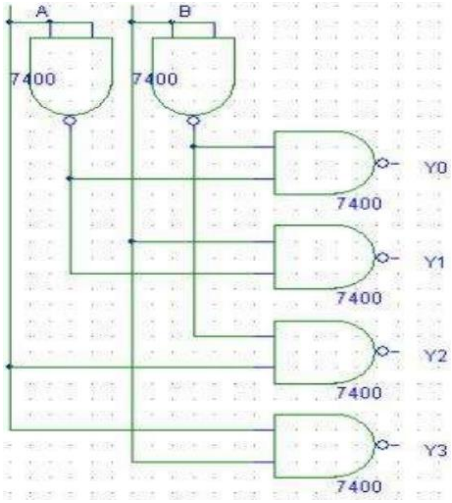


▪ 2:4 DECODER (MAX TERM GENERATOR):

Truth Table:

INPUT		OUTPUT			
A	B	Y0	Y1	Y2	Y3
0	0	0	1	1	1
0	1	1	0	1	1
1	0	1	1	0	1
1	1	1	1	1	0

Circuit Diagram:



Discussions:

The 2 to 4 line binary decoder depicted above consists of an array of four AND gates. The 2 binary inputs labelled A and B are decoder into one of 4 outputs, hence the description of 2 to 4 binary decoder .Each output represents one of the minterms of the 2 inputs variables ,(each outputs= a minterm).

3 to 8 Decoder:

x	y	z	D0	D1	D2	D3	D4	D5	D6	D7
0	0	0	1	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0	0
0	1	0	0	0	1	0	0	0	0	0
0	1	1	0	0	0	1	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0
1	0	1	0	0	0	0	0	1	0	0
1	1	0	0	0	0	0	0	0	1	0
1	1	1	0	0	0	0	0	0	0	1

D0=x’y’z’ D4=xy’z’

D1=x’y’z D5=xy’z

D2=x’yz’ D6=xyz’

D3=x’yz D7=xyz