EXPERIMENT NO. 7

TITLE: Implementation and verification of decoder/de-multiplexer and encoder using logic gates.

▪ OBJECTIVE:

To analyse the truth table of 4*2 decoder/de-multiplexer using NOT (7404) and AND (7408) logic gate ICs and 2 * 4 encoder using OR (7432) logic gate IC and to understand the working of 4 * 2 decoder and 2 * 4 encoder circuit with the help of LEDs display.

▪ APPARATUS REQUIRED:

- Switches
- Power supply
- Resistances
- LEDs
- IC 7408 AND Gates, 7404 Hex inverters , etc

▪ THEORY:

2x4 Decoder / De-multiplexer :

The name “Decoder” means to translate or decode coded information from one format into another, so a digital decoder transforms a set of digital input signals into an equivalent decimal code at its output

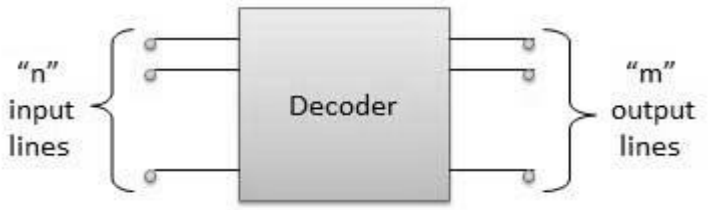
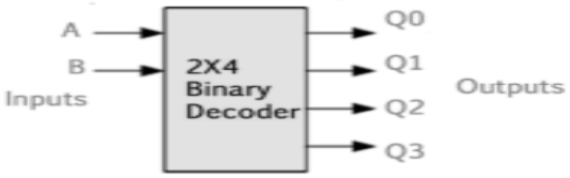


Figure . Logic Diagram of Decoder

2-to-4 Binary Decoder*:*

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 decoded into one of 4 outputs, hence the description of 2-to-4 binary decoder. Each output represents one of the minterms of the 2 input variables, (each output = a minterm).



A	B	Q0	Q1	Q2	Q3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

Figure 3. Logic Diagram and Truth table of 2-to-4 Decoder

Encoder :

An Encoder is a combinational circuit that performs the reverse operation of Decoder.It has maximum of 2^n input lines and 'n' output lines, hence it encodes the information from 2^n inputs into an n-bit code. It will produce a binary code equivalent to the input, which is active High. Therefore, the encoder encodes 2^n input lines with 'n' bits.

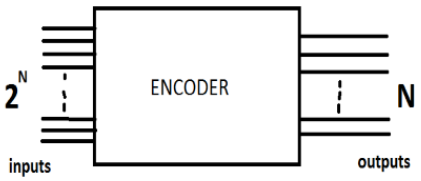
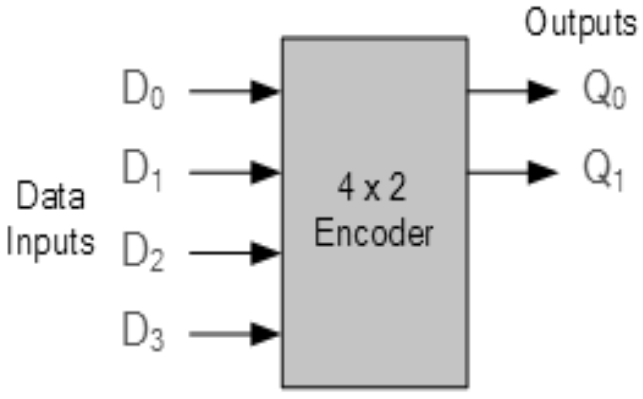


Figure . Logic Diagram of ENCODER

4 : 2 Encoder :

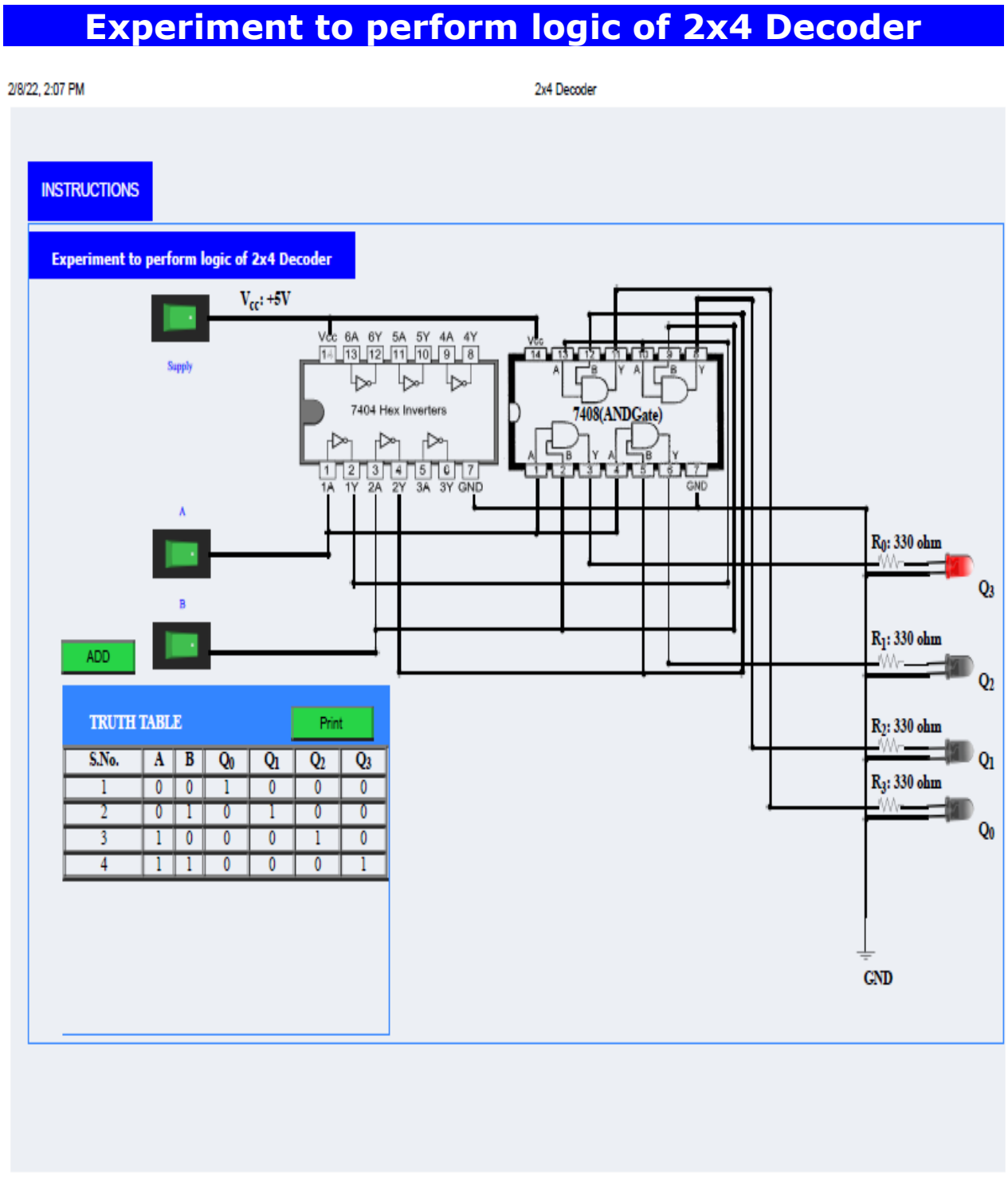
The 4 to 2 Encoder consists of four inputs Y3, Y2, Y1 & Y0 and two outputs A1 & A0. At any time, only one of these 4 inputs can be '1' in order to get the respective binary code at the output.



Inputs				Outputs	
D_3	D_2	D_1	D_0	Q_1	Q_0
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1
0	0	0	0	x	x

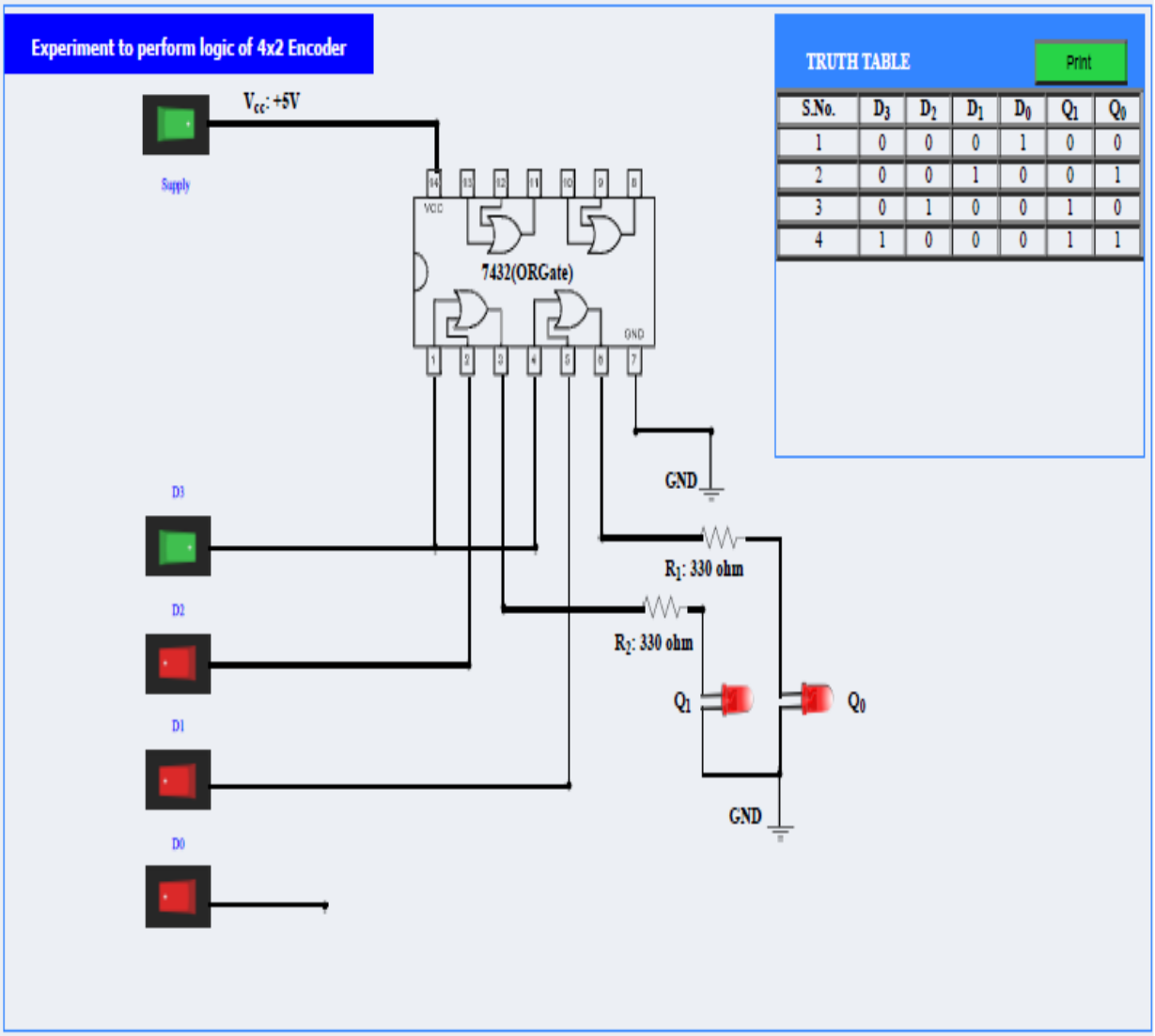
Figure . Logic symbol and truth table of 4 to 2 encoder

- **CIRCUIT DIAGRAM:**



Experiment to perform logic of 4x2 Encoder

INSTRUCTIONS



TRUTH TABLE Print

S.No.	D_3	D_2	D_1	D_0	Q_1	Q_0
1	0	0	0	1	0	0
2	0	0	1	0	0	1
3	0	1	0	0	1	0
4	1	0	0	0	1	1

- **CALCULATIONS:**

- Truth Table Of 2x4 Decoder :

TRUTH TABLE

S. No.	A	B	Q_0	Q_1	Q_2	Q_3
1	0	0	1	0	0	0
2	0	1	0	1	0	0
3	1	0	0	0	1	0
4	1	1	0	0	0	1

- Truth Table Of 4x2 Encoder :

TRUTH TABLE

S. No.	D_3	D_2	D_1	D_0	Q_1	Q_0
1	0	0	0	1	0	0
2	0	0	1	0	0	1
3	0	1	0	0	1	0
4	1	0	0	0	1	1

- **RESULTS:**
- Verified the Truth Table of 2-to-4 Binary Decoder
- Verified the Truth Table of 4-to-2 Binary Encoder

- **PRECAUTIONS:**

• All the connections should be made properly as per the circuit diagram.

• Connections should be tight and easy to inspect.

• Power supply should be 5v.

• Keep the switch turned off while making connections.