EXPERIMENT NO:-6

➢ **AIM:** To Design and test decoder circuit.

➢ **APPARATUS:** Logisim simulator

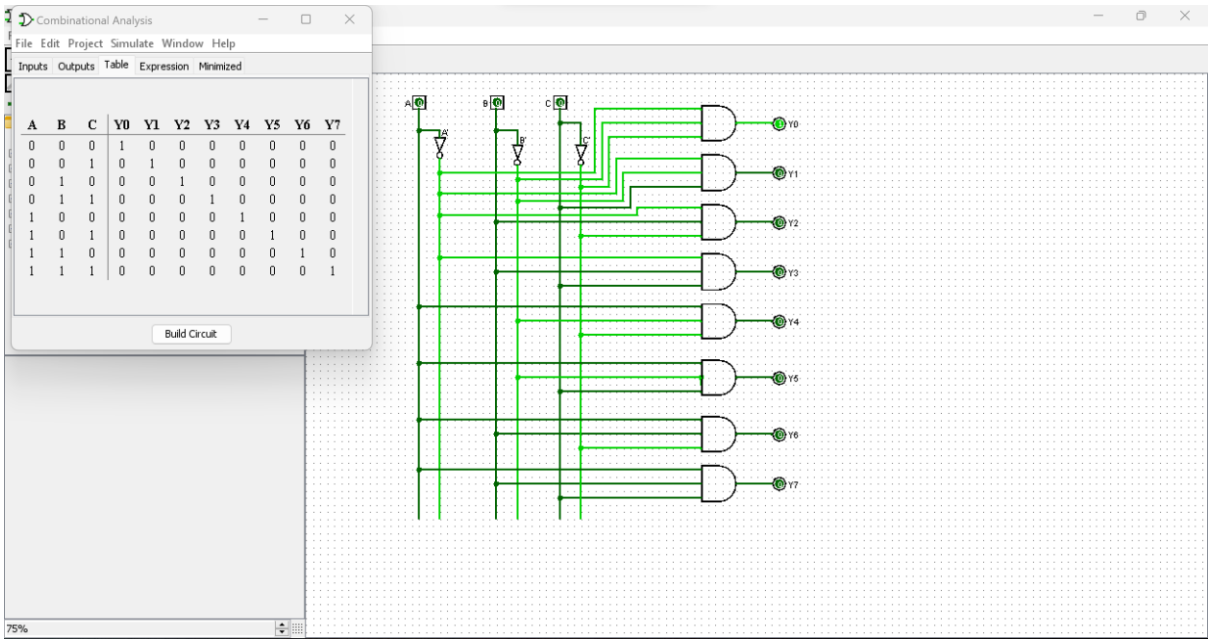
➢ **THEORY:**

Discrete quantities of information are represented in digital systems with binary codes. A binary code of n bits is capable of representing up to 2^n distinct elements of the coded information. A decoder is a combinational circuit that converts binary information from n input lines to a maximum of 2^n unique output lines. If the n-bit decoded information has unused or don't-care combinations, the decoder output will have less than 2^n outputs.

The decoders presented here are called n-to-m line decoders where m<=2^n. Their purpose is to generate the 2^n (or less) minterms of n input variables. The name decoder is also used in conjunction with some code such as BCD-to seven -segment decoder.

Consider the 3 to 8 line decoder circuit. The three inputs are decoded into eight outputs. Each output representing one of the minterms of the 3-input variables. The three inverters provide the complement of the outputs, and each one of eight AND gates generate one of the minterms. A particular application of this decoder would be a binary to octal conversion. The input variables may represent a binary number, and the outputs will then represent the eight digits in the octal number system. However a 3-to-8-line decoder can be used for decoding and 3-bit code to provide eight outputs, one for each element of the code.

CIRCUIT DIAGRAM OF 3 TO 8 BIT DECODER:



TRUTH TABLE OF 3 TO 8 BIT DECODER:

INPUTS				OUTPUTS							
ENABLE	ADDRESS LINES										
EN	A	B	C	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
1	0	0	0	1	0	0	0	0	0	0	0
1	0	0	1	0	1	0	0	0	0	0	0
1	0	1	0	0	0	1	0	0	0	0	0
1	0	1	1	0	0	0	1	0	0	0	0
1	1	0	0	0	0	0	0	1	0	0	0
1	1	0	1	0	0	0	0	0	1	0	0
1	1	1	0	0	0	0	0	0	0	1	0
1	1	1	1	0	0	0	0	0	0	0	1

CONCLUSION - Designing and testing a decoder circuit (using AND - NOT) is a fundamental exercise in digital electronics, providing practical experience and reinforcing key concepts in binary decoding and logic circuits.