

Dtd: 14/1/22

Submitted by - (Sec-B) ¹

ASSIGNMENT-5

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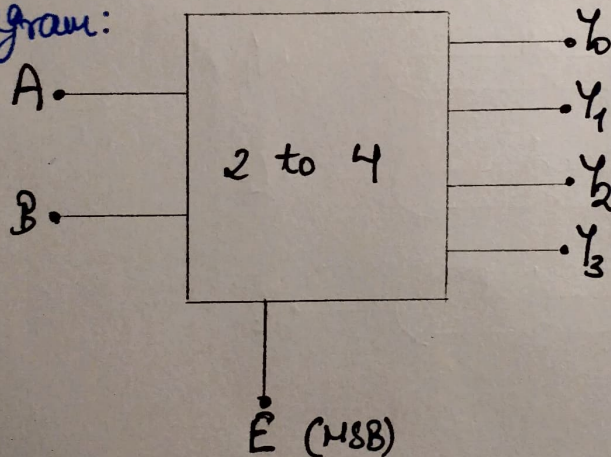
DECODERS

AIM: Truth table and diagrams for 2 to 4, 3 to 8 and 4 to 16 decoders, to get familiar with decoders.

SOFTWARE USED: Logisim.

(I) 2 to 4 decoder →

Block diagram:



Truth table:

E	A	B	Y ₀	Y ₁	Y ₂	Y ₃
0	x	x	0	0	0	0
1	0	0	1	0	0	0
1	0	1	0	1	0	0
1	1	0	0	0	1	0
1	1	1	0	0	0	1

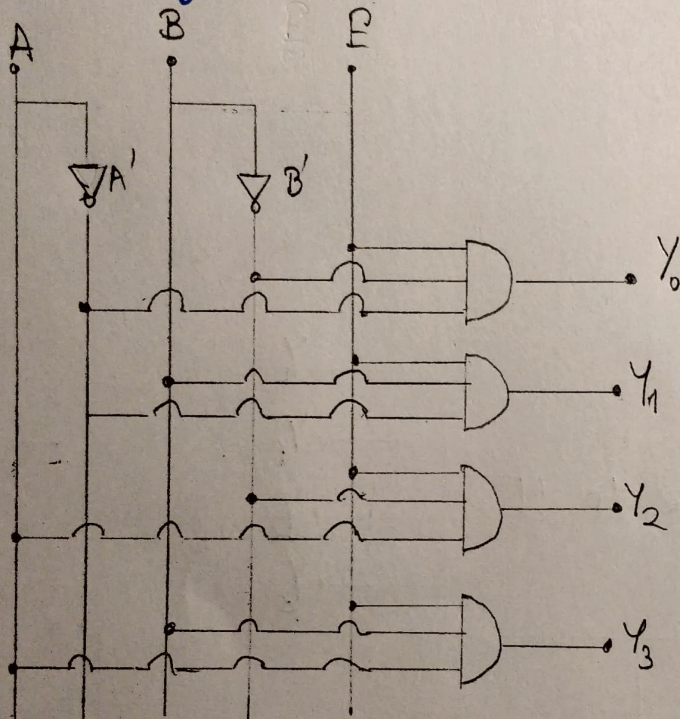
Expressions: $Y_0 = E \bar{A} \bar{B}$

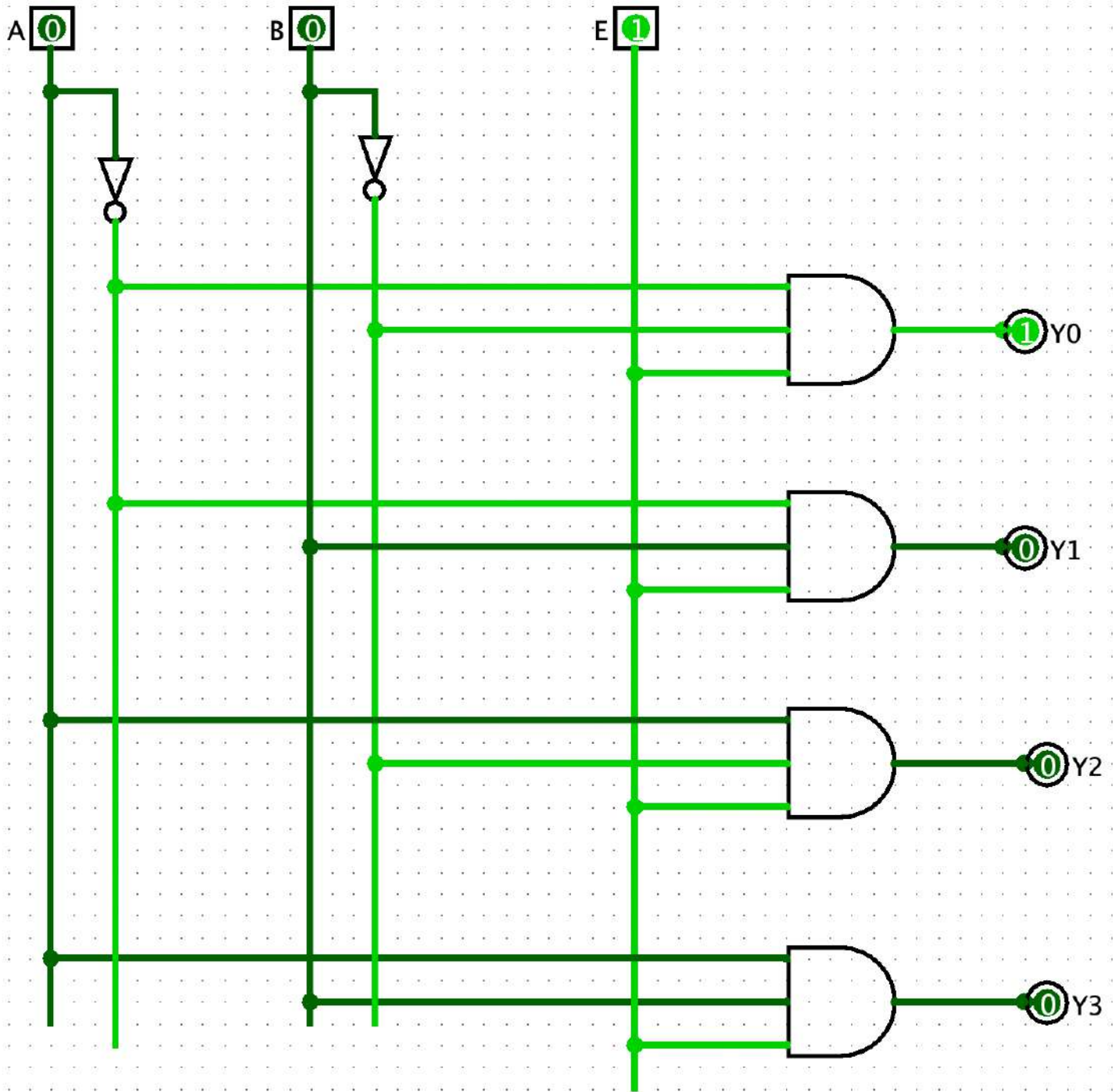
$$Y_1 = E \bar{A} B$$

$$Y_2 = E A \bar{B}$$

$$Y_3 = E A B$$

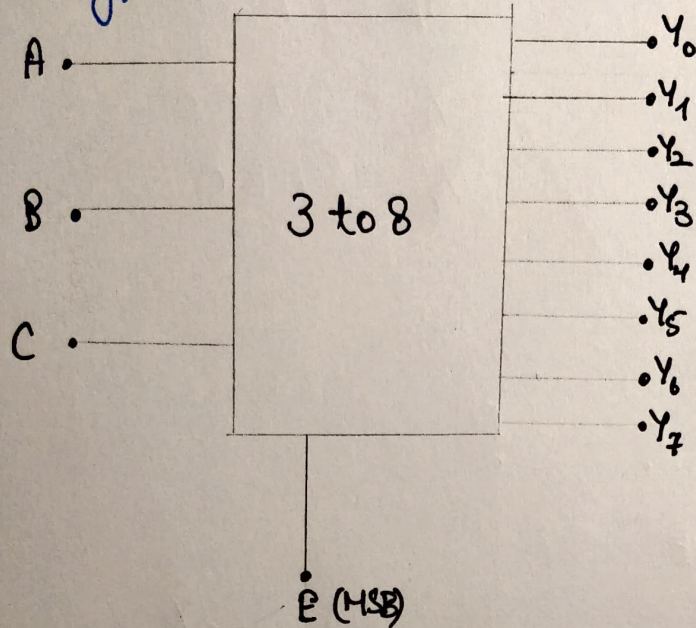
Circuit diagram:





(II) 3 to 8 decoder →

Block diagram:



Truth table:

E	A	B	C	Y ₀	Y ₁	Y ₂	Y ₃	Y ₄	Y ₅	Y ₆	Y ₇
0	x	x	x	0	0	0	0	0	0	0	0
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

Expressions:

$$Y_0 = E \bar{A} \bar{B} \bar{C}$$

$$Y_1 = E \bar{A} \bar{B} C$$

$$Y_2 = E \bar{A} B \bar{C}$$

$$Y_3 = E \bar{A} B C$$

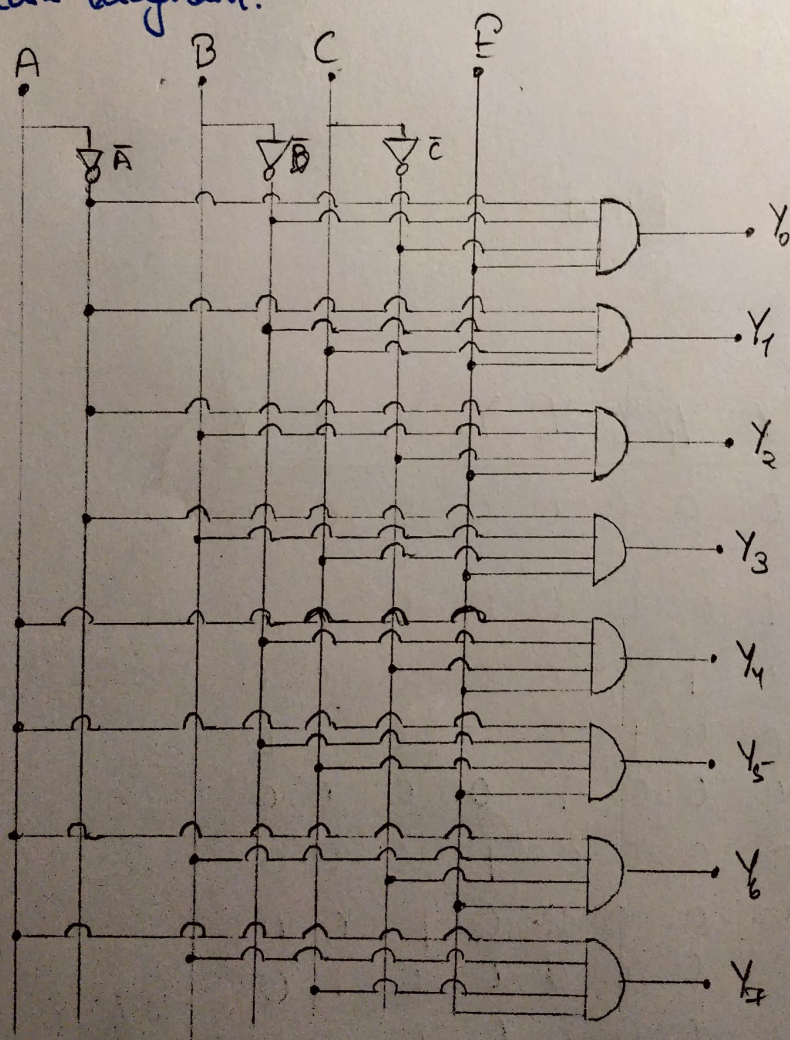
$$Y_4 = E A \bar{B} \bar{C}$$

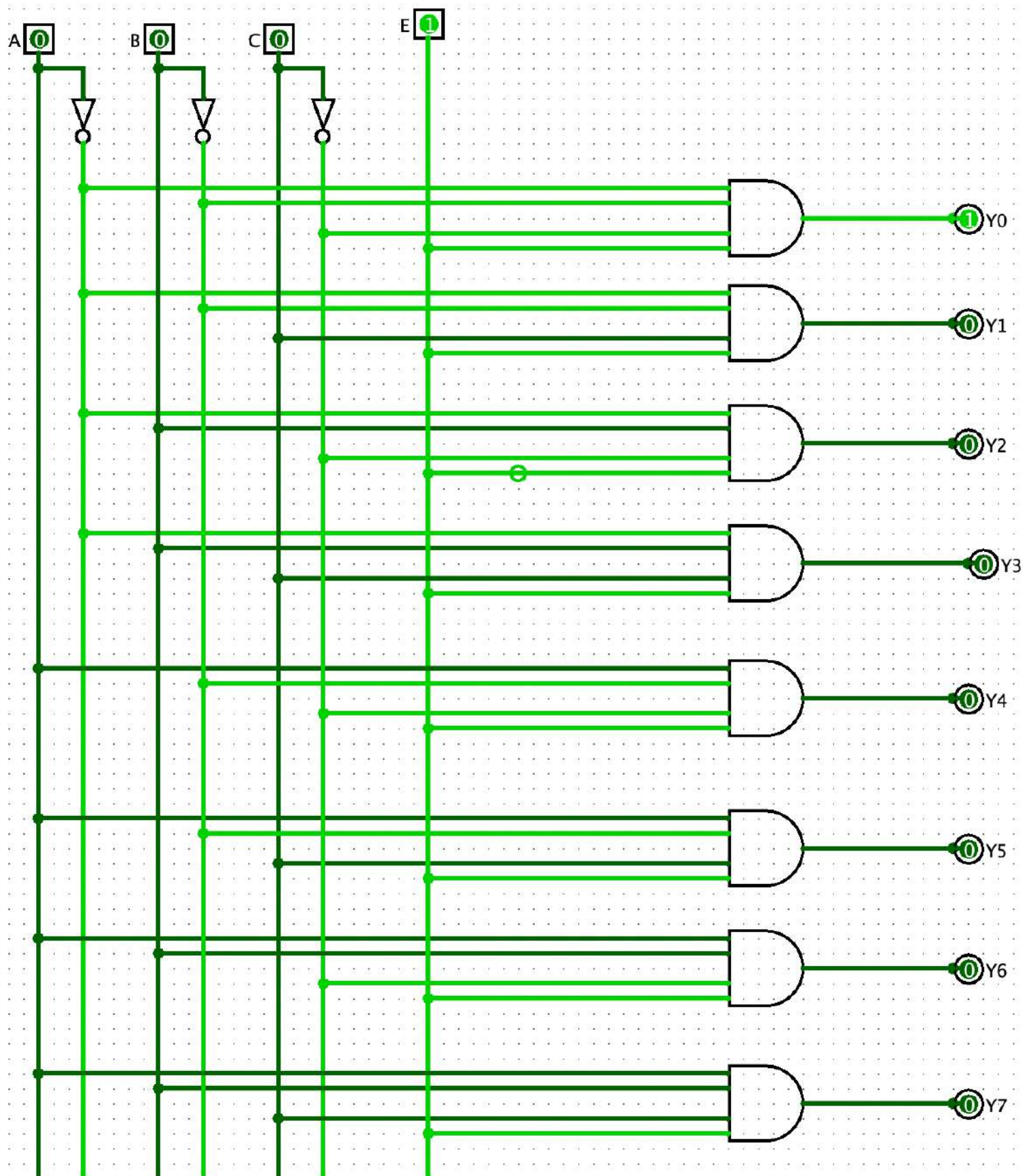
$$Y_5 = E A \bar{B} C$$

$$Y_6 = E A B \bar{C}$$

$$Y_7 = E A B C$$

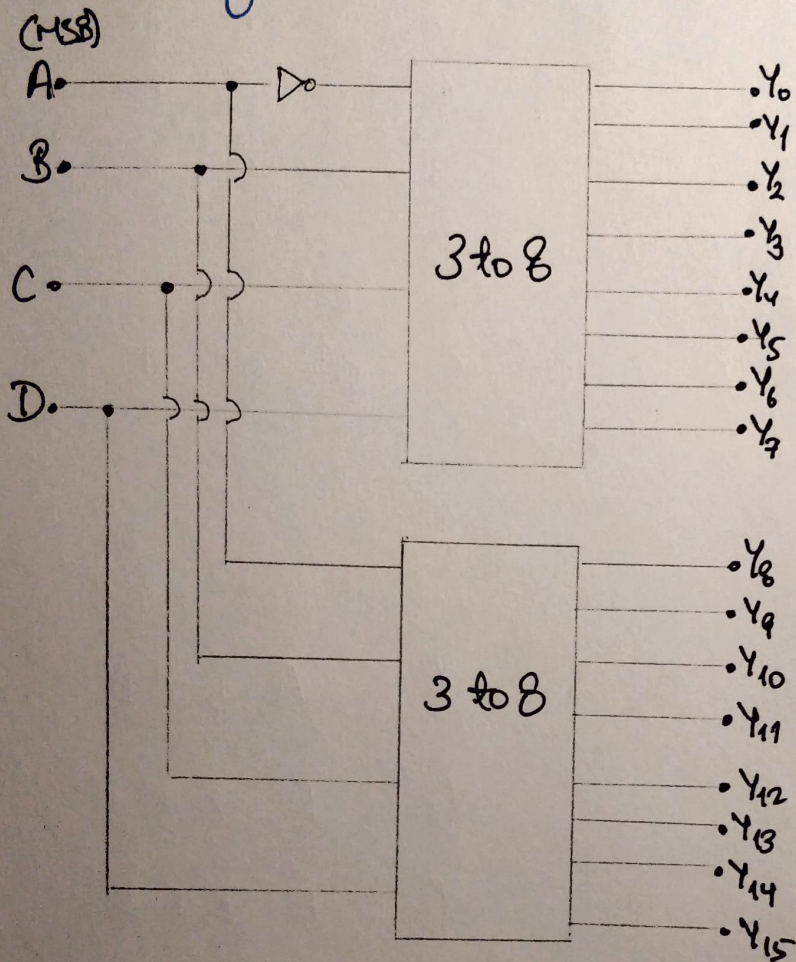
Circuit diagram:





(III) 4 to 16 decoder →

Block diagram:



Truth table: A being the MSB acts as enable

A	B	C	D	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7
0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	1	0	1	0	0	0	0	0	0
0	0	1	0	0	0	1	0	0	0	0	0
0	0	1	1	0	0	0	1	0	0	0	0
0	1	0	0	0	0	0	0	1	0	0	0
0	1	0	1	0	0	0	0	0	1	0	0
0	1	1	0	0	0	0	0	0	0	1	0
0	1	1	1	0	0	0	0	0	0	0	1

For
1st
3 to 8

A	B	C	D	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}	Y_{13}	Y_{14}	Y_{15}
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

for
9th
3 to 8

Expressions:

1st 3 to 8

$$Y_0 = \bar{A} \bar{B} \bar{C} \bar{D}$$

$$Y_1 = \bar{A} \bar{B} \bar{C} D$$

$$Y_2 = \bar{A} \bar{B} C \bar{D}$$

$$Y_3 = \bar{A} \bar{B} C D$$

$$Y_4 = \bar{A} B \bar{C} \bar{D}$$

$$Y_5 = \bar{A} B \bar{C} D$$

$$Y_6 = \bar{A} B C \bar{D}$$

$$Y_7 = \bar{A} B C D$$

2nd 3 to 8

$$Y_8 = A \bar{B} \bar{C} \bar{D}$$

$$Y_9 = A \bar{B} \bar{C} D$$

$$Y_{10} = A \bar{B} C \bar{D}$$

$$Y_{11} = A \bar{B} C D$$

$$Y_{12} = A B \bar{C} \bar{D}$$

$$Y_{13} = A B \bar{C} D$$

$$Y_{14} = A B C \bar{D}$$

$$Y_{15} = A B C D$$

