(Lab-8)

⇒ Encoder
⇒ 4x2 Encoder
⇒ Priority Encoder
⇒ Decoder
⇒ 2x4 decoder, 3x8 decoder
⇒ Applications

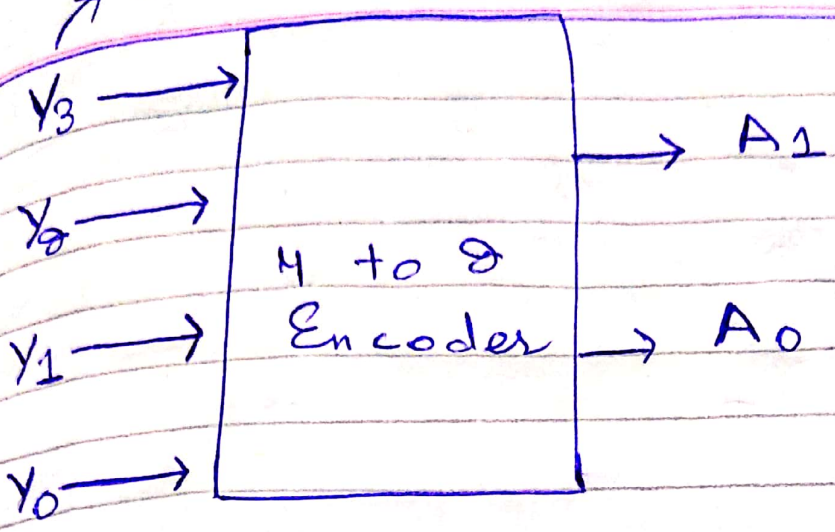
(Encoder)

⇒ An encoder is a combinational circuit that converts binary information in the form of a 2^n input lines into N output lines, which represents N bit code for the input.

⇒ For simple encoders it is assumed that only one input line is active at a time

⇒ It performs the inverse operation of decoder.

only "1" input can be one



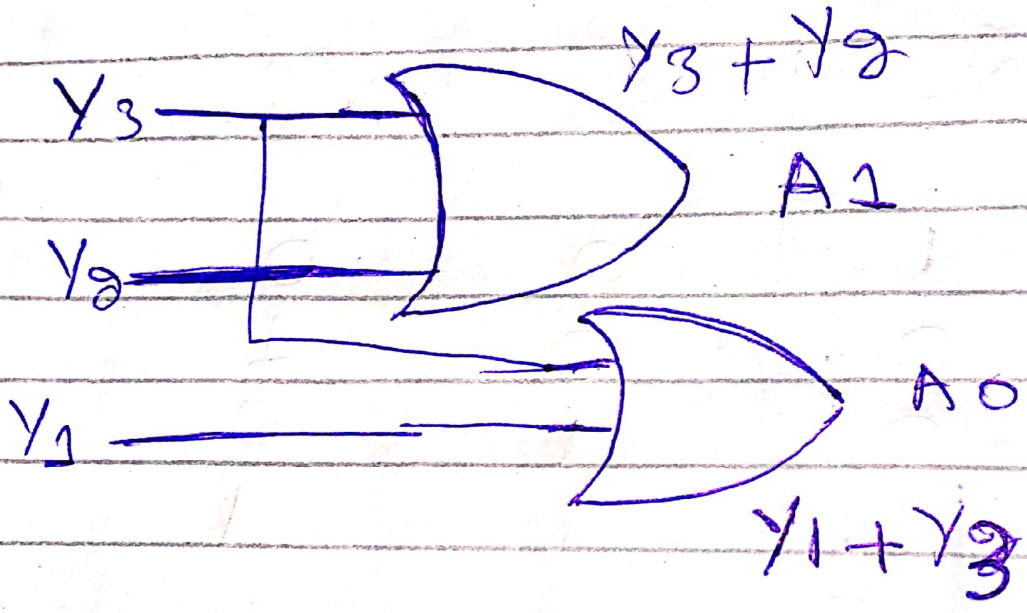
Y_3	Y_2	Y_1	Y_0	A_1	A_0
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1

⇒ Basically input represent the decimal number mean (Y_0) → 0 in binary will be $(A_1\ 0, A_0\ 0)$ and (Y_1) → means "1" in in binary will be $(A_1, 0)$ $(A_0, 1)$

Now

$A_1 = Y_3 + Y_2$

$A_0 = Y_3 + Y_1$

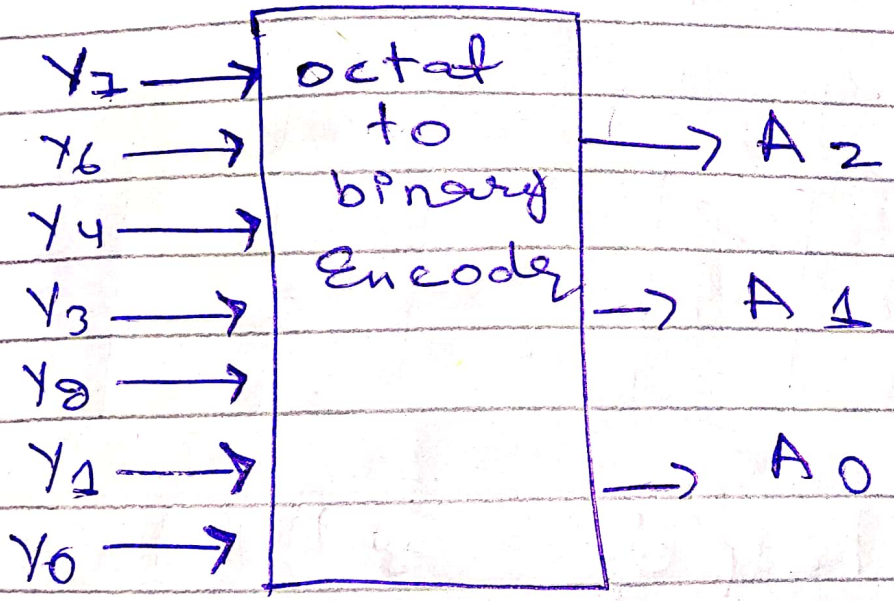


(Octal to Binary Encoder)

⇒ Octal to binary encoder has eight inputs, Y_7 to Y_0 and three outputs which are A_2, A_1, A_0. "Format $2^n = n$ (i/p) (o/p)"

Octal to binary encoder is nothing but 8 to 3 encoder.

⇒ ~~The block diagram of octal to binary encoder~~



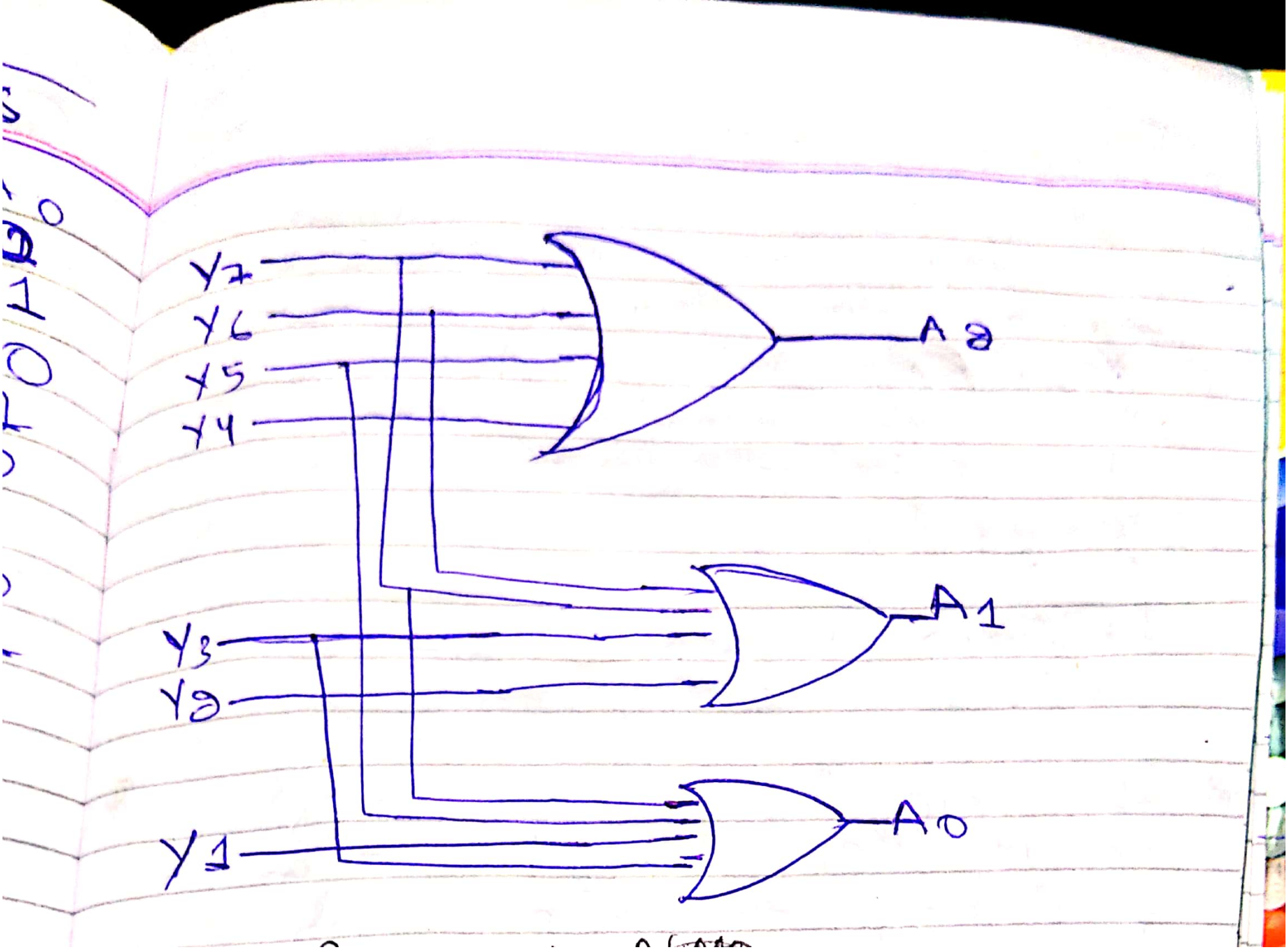
Inputs								Outputs		
Y_7	Y_6	Y_5	Y_4	Y_3	Y_2	Y_1	Y_0	A_2	A_1	A_0
0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	1	0	0	0	1
0	0	0	0	0	1	0	0	0	1	0
0	0	0	0	1	0	0	0	0	1	1
0	0	0	1	0	0	0	0	1	0	0
0	0	1	0	0	0	0	0	1	0	1
0	1	0	0	0	0	0	0	1	1	0
1	0	0	0	0	0	0	0	1	1	1

=) with the help of truth table the boolean expression for the A_2, A_1, A_0 is

$A_2 = Y_7 + Y_6 + Y_5 + Y_4$

$A_1 = Y_7 + Y_6 + Y_3 + Y_2$

$A_0 = Y_7 + Y_5 + Y_3 + Y_1$.



(Draw backs)

⇒ If we are giving two (high) means Eg:- Y_3, Y_6, both are "1" then we won't gonna get the actual output

(Draw backs of Encoder)

⇒ If more than one input is active High, then the encoder produces an output, which may not be the correct code. Eg:- if both Y_3 and Y_6 are "1" then the encoder produces 111 at the output. This is neither equivalent code corresponding to Y_3, when it is "1" nor the equivalent code corresponding to Y_6 when it is "1".

⇒ There is an ambiguity, when all outputs of encoder are equal to zero. Because it could be the code

corresponding to the inputs. when only least significant input is one or when all inputs are zero.

⇒ So to overcome these difficulties, we should assign priorities to each input of encoder. Then, the output of encoder will be the binary code corresponding to the active high inputs, which has higher priority.

⇒ This encoder is called priority encoder

(Priority Encoder)

⇒ If two or more input lines are high at the same time i.e 1 at the same time, then the input line with high priority shall be considered.

⇒ There are four inputs Y_0, Y_1 Y_2, Y_3 and two outputs A_1 and A_0

⇒ Y_3 has highest priority and Y_0 is at lowest priority.

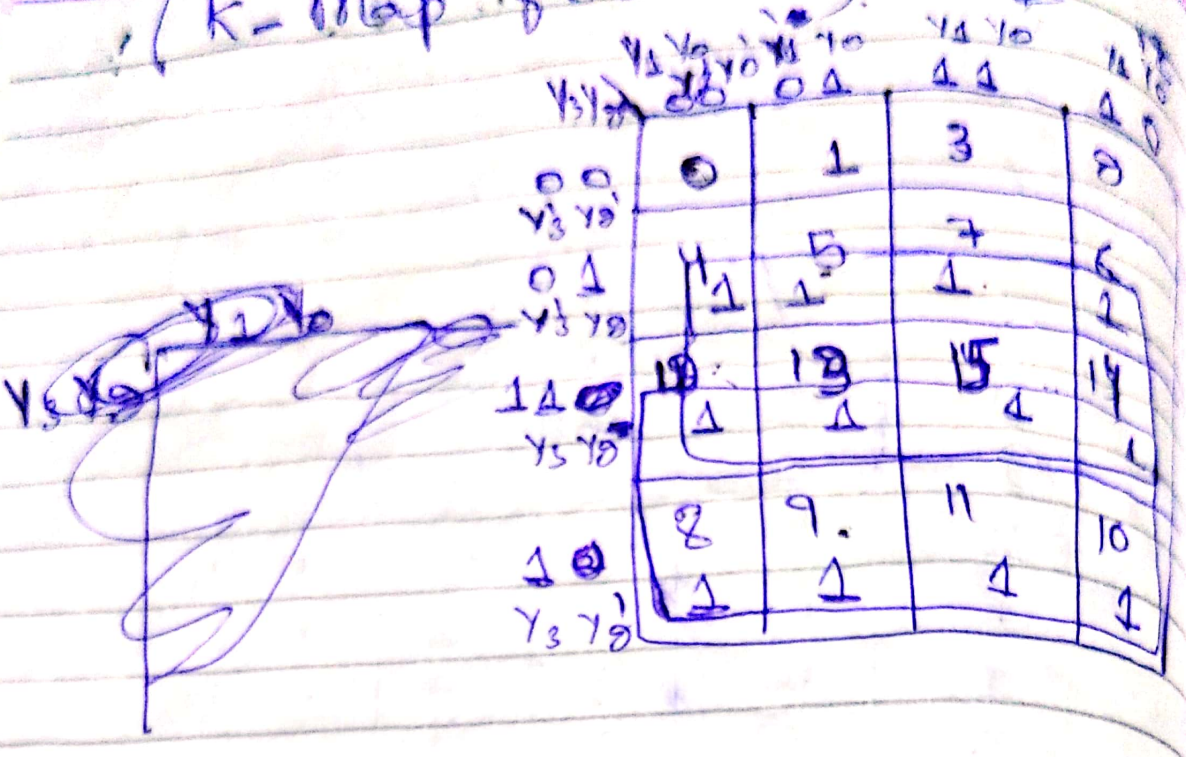
⇒ If $I_3 = 1$, irrespective of other inputs then output is Y_3 is

S.NO
0
1
2
3
4
5
6
7
8
9
10

(Priority Encoder)

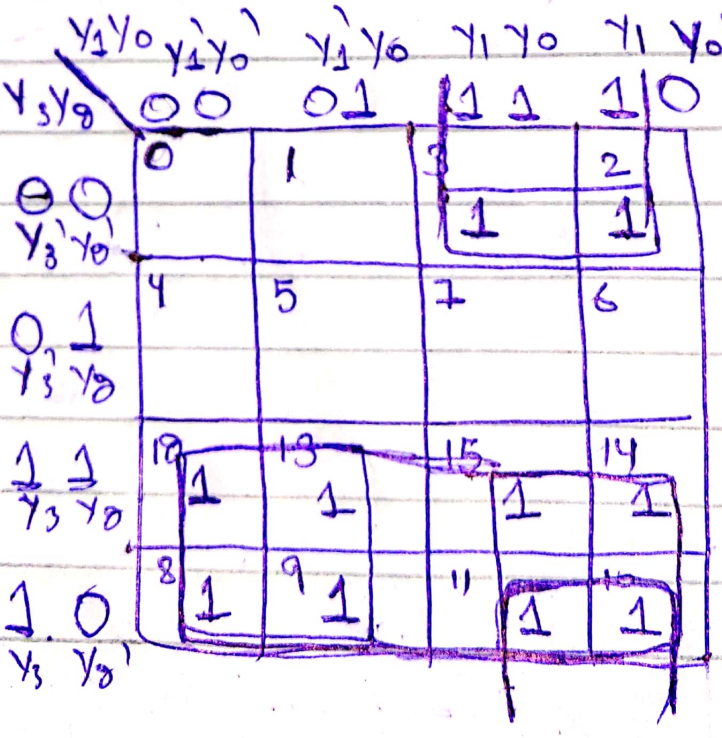
S.No	Y_3	Y_2	Y_1	Y_0	A_1	A_0	V
0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	1
2	0	0	1	0	0	1	1
3	0	0	1	1	0	1	1
4	1	1	0	0	1	0	1
5	1	1	0	1	1	0	1
6	1	1	1	0	1	0	1
7	1	1	1	1	1	0	1
8	1	0	0	0	1	1	1
9	1	0	0	1	1	1	1
10	1	0	1	0	1	1	1
11	1	0	1	1	1	1	1
12	1	1	0	0	1	1	1
13	1	1	0	1	1	1	1
14	1	1	1	0	1	1	1
15	1	1	1	1	1	1	1

K-Map for A1



$$A_1 = Y_3 + Y_2$$

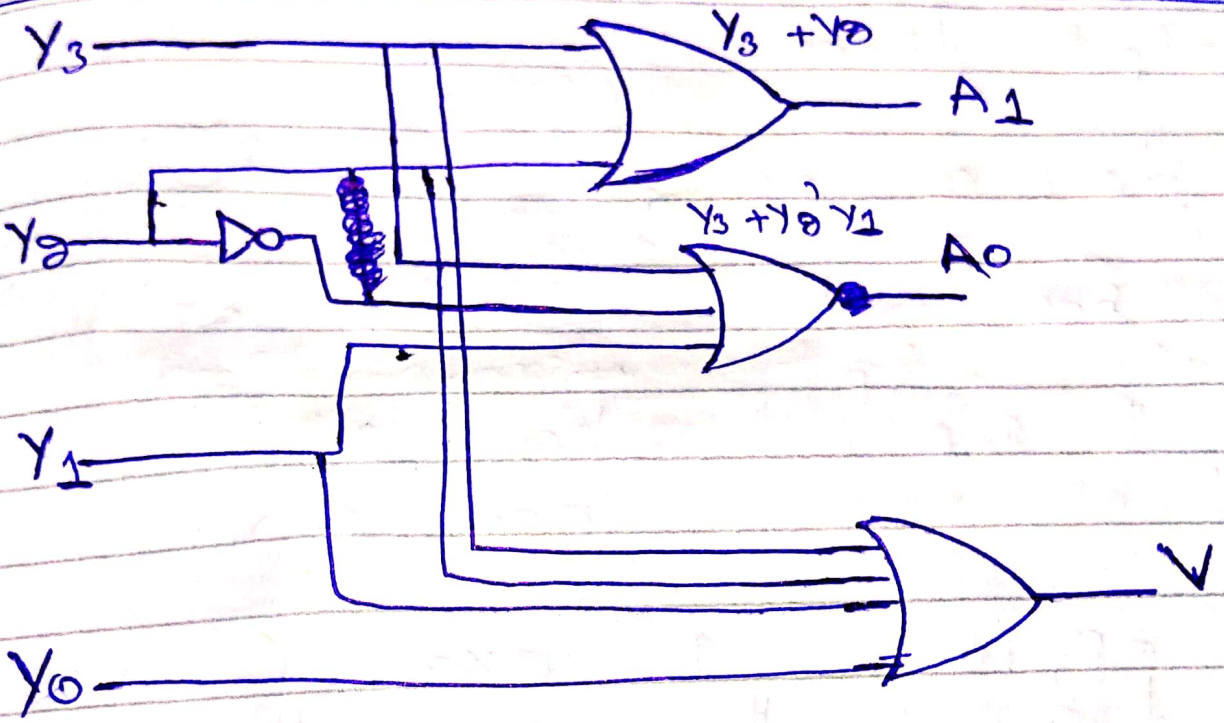
K-Map for A0



$A_0 = Y_3 + Y_2 \bar{Y}_1$

and

$V = Y_3 + Y_2 + Y_1 + Y_0$



A_1

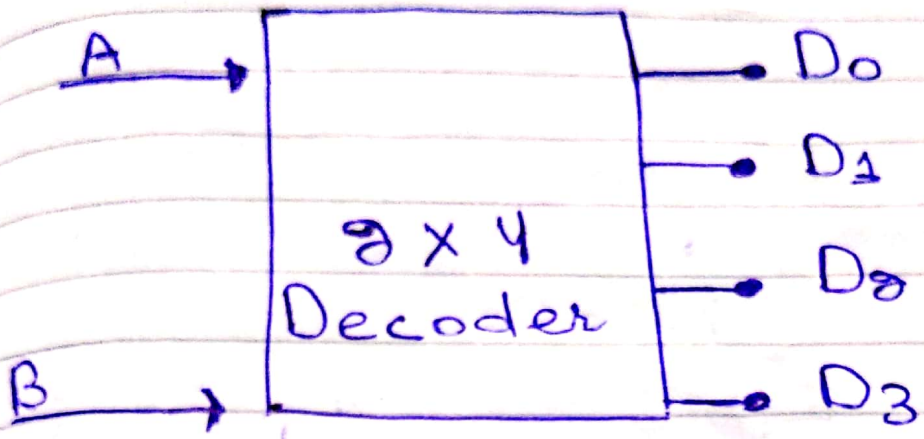
(Decoder)

⇒ Decoder is a combinational circuit that has "n" input lines and maximum of 2^n output lines.

⇒ A decoder accepts a set of inputs that represents a binary number and activates only that output corresponding to the input number. All the outputs remain inactive.

⇒ its operation is exactly reverse as that of the encoder.

Let 2 to 4 Decoder has two inputs A_1 and A_0 and four outputs, Y_3, Y_2, Y_1, Y_0. The block diagram and truth table of 2 to 4 decoder is shown in following fig



Input		outputs			
A	B	D0	D1	D2	D3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

$D0 = A' \cdot B'$

$D1 = A' \cdot B$

$D2 = A \cdot B'$

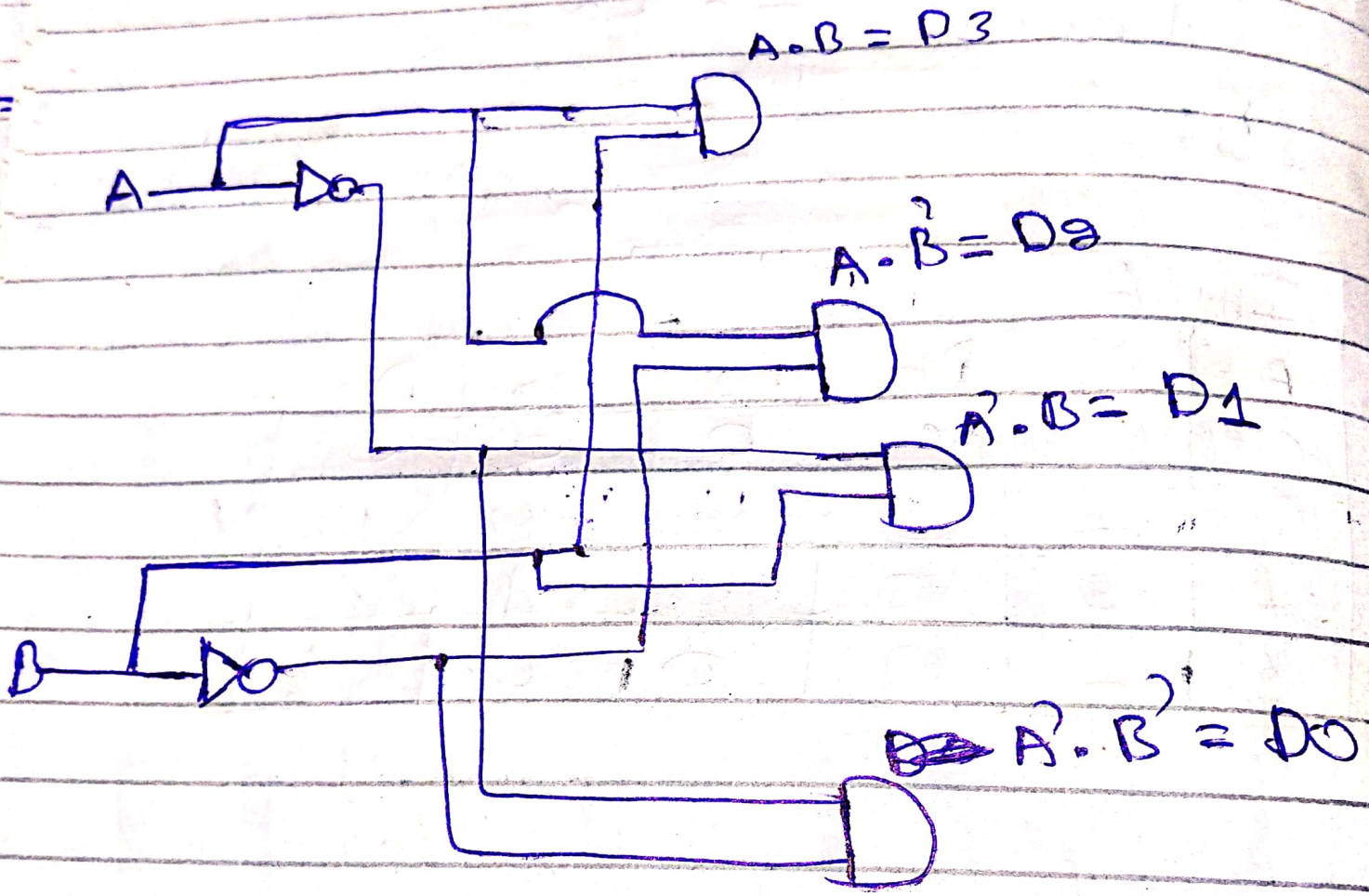
$D3 = A \cdot B$

$D_3 = A \cdot B$

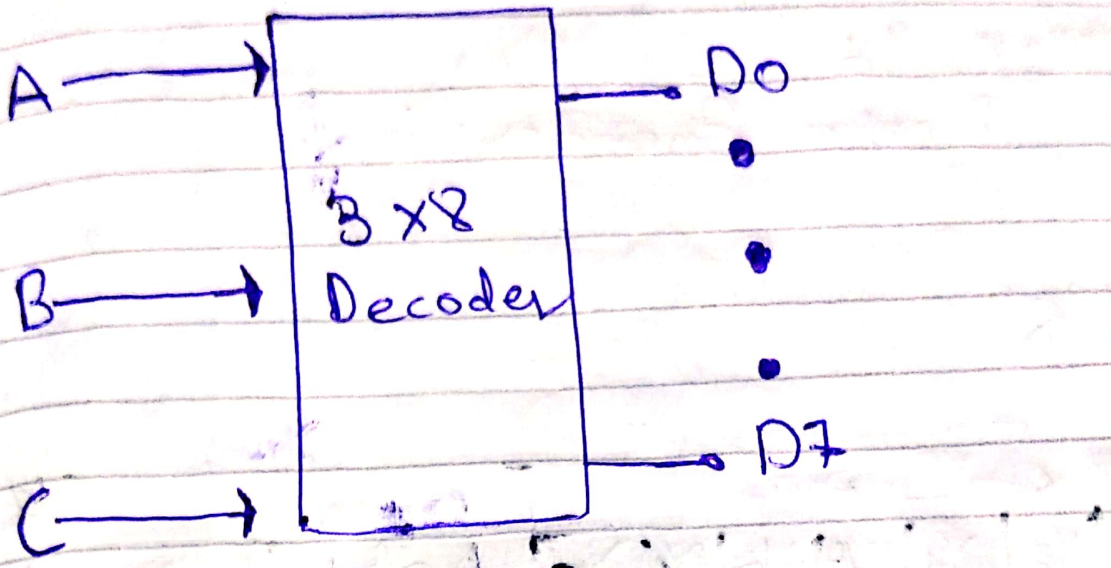
$D_2 = A \cdot B'$

$D_1 = A' \cdot B$

$D_0 = A' \cdot B'$



(3 To 8 Line Decoder)



Inputs			outputs								$D_0 = \bar{A}\bar{B}\bar{C}$
A	B	C	D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7	
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	