

# Design and Implement 4 to 16 Line decoder.

A	B	C	D	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15

TRUTH TABLE

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Equations:

$$D_0 = \bar{A}\bar{B}\bar{C}\bar{D}$$

$$D_1 = \bar{A}\bar{B}\bar{C}D$$

$$D_2 = \bar{A}\bar{B}C\bar{D}$$

$$D_3 = \bar{A}\bar{B}CD$$

$$D_4 = \bar{A}B\bar{C}\bar{D}$$

$$D_5 = \bar{A}B\bar{C}D$$

$$D_6 = \bar{A}BC\bar{D}$$

$$D_7 = \bar{A}BCD$$

$$D_8 = A\bar{B}\bar{C}\bar{D}$$

$$D_9 = A\bar{B}\bar{C}D$$

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

$$D_{11} = A\bar{B}CD$$

$$D_{12} = AB\bar{C}\bar{D}$$

$$D_{13} = AB\bar{C}D$$

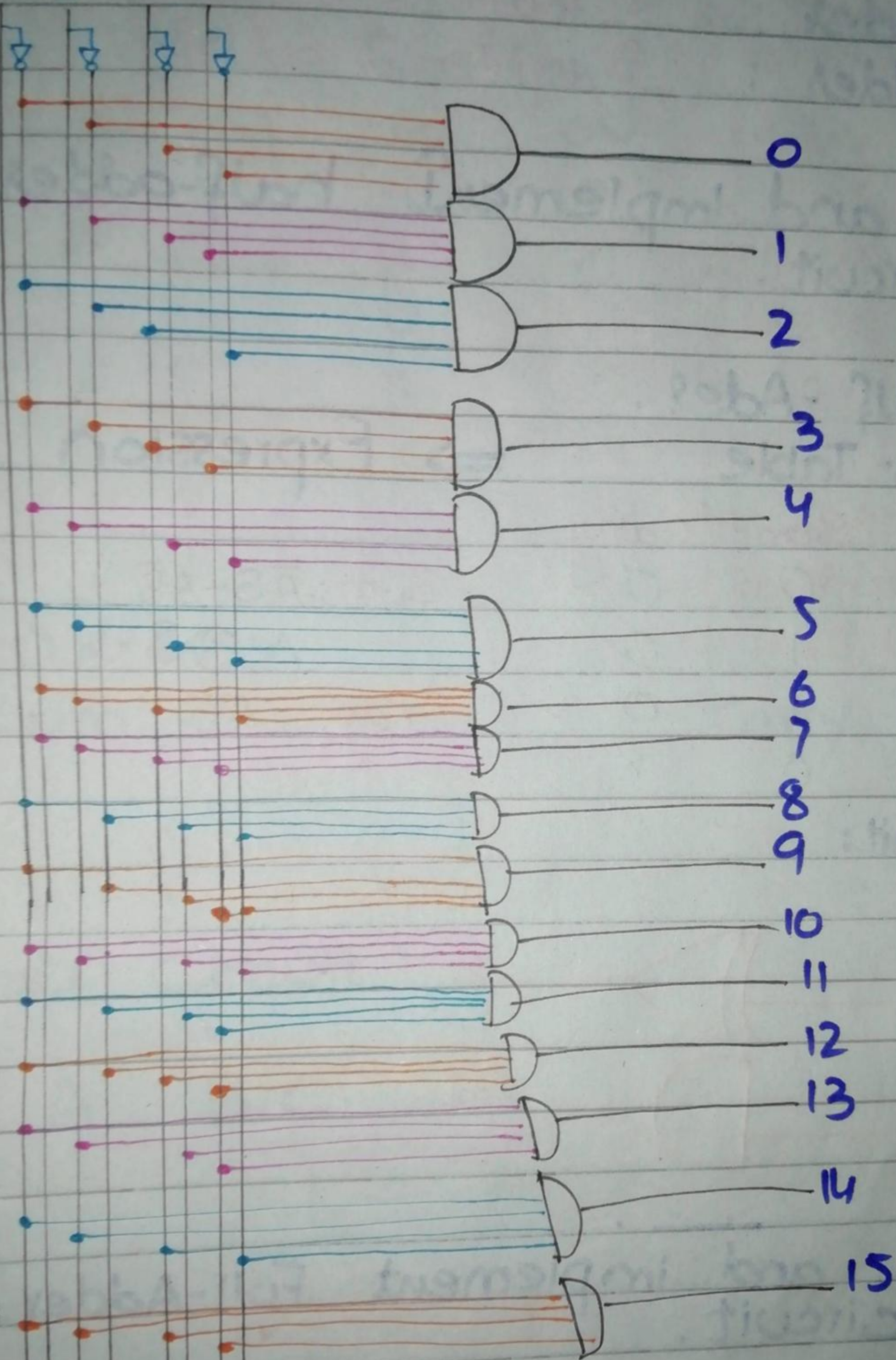
$$D_{14} = ABC\bar{D}$$

$$D_{15} = ABCD$$



# Circuit:

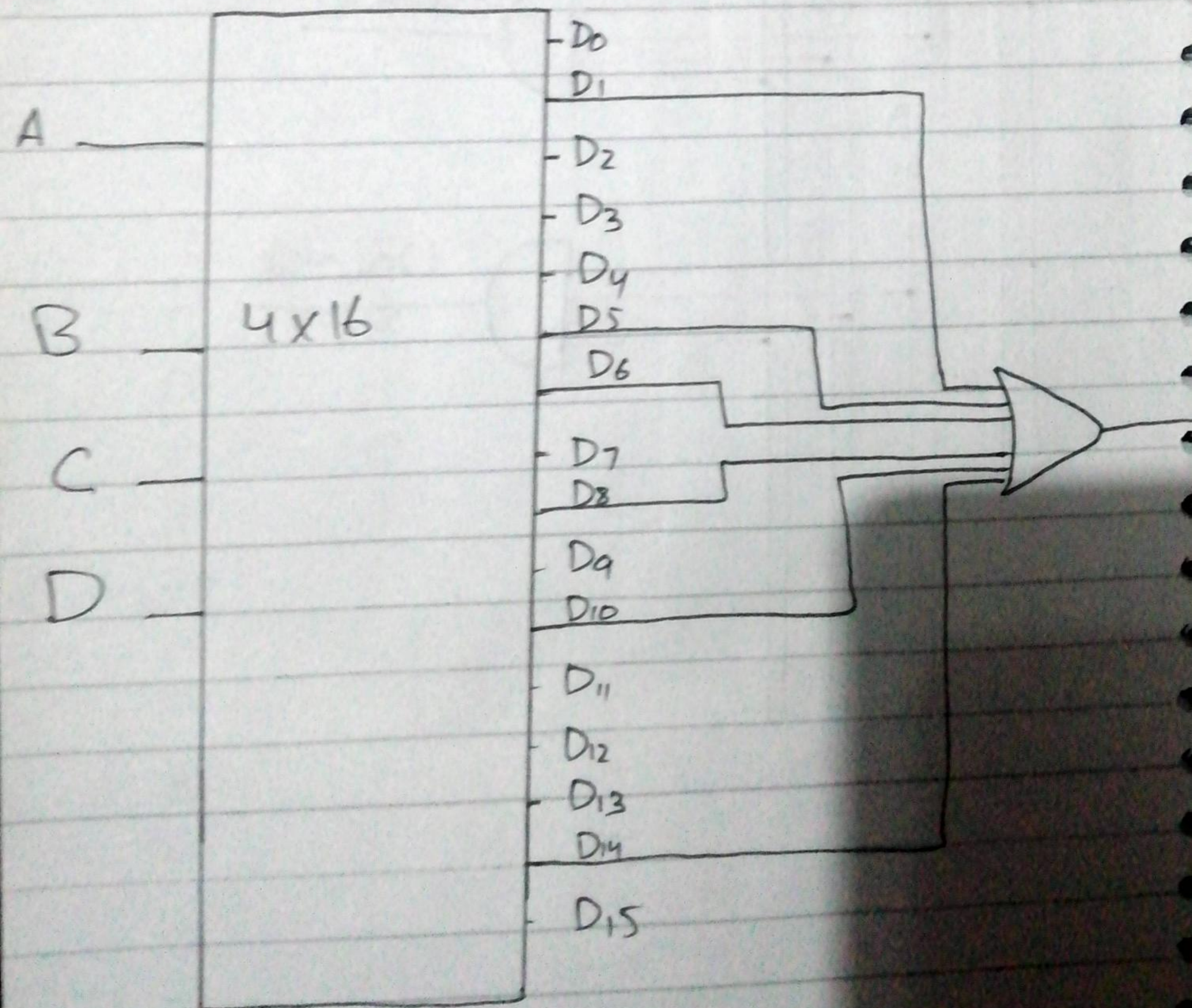
A B C D





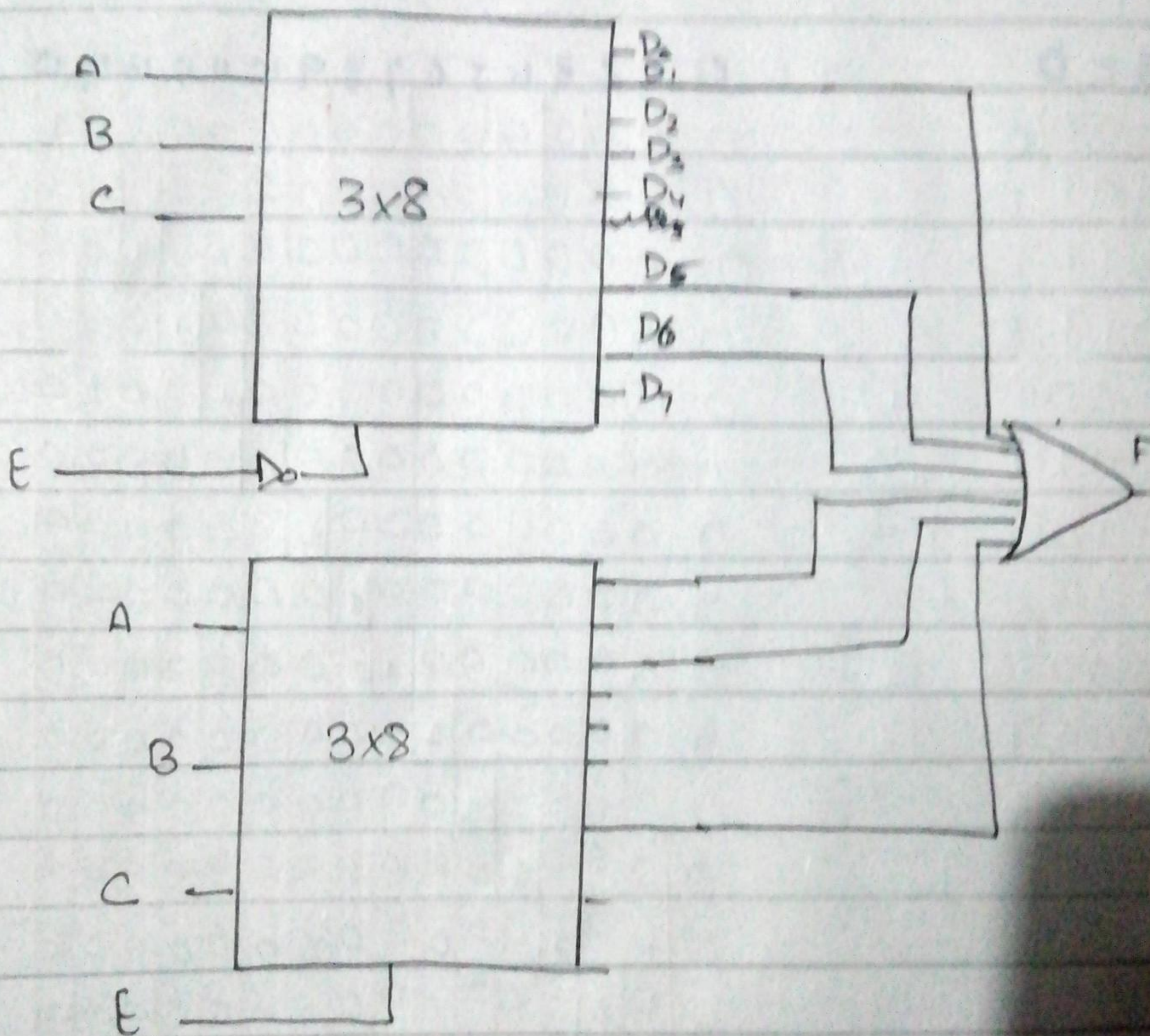
$F(A, B, C, D) = \sum (1, 5, 6, 8, 10, 14)$   
Implement with the help of decoder.

i) 4 to 16





ii) 3 To 8 decoder (with enable bit)



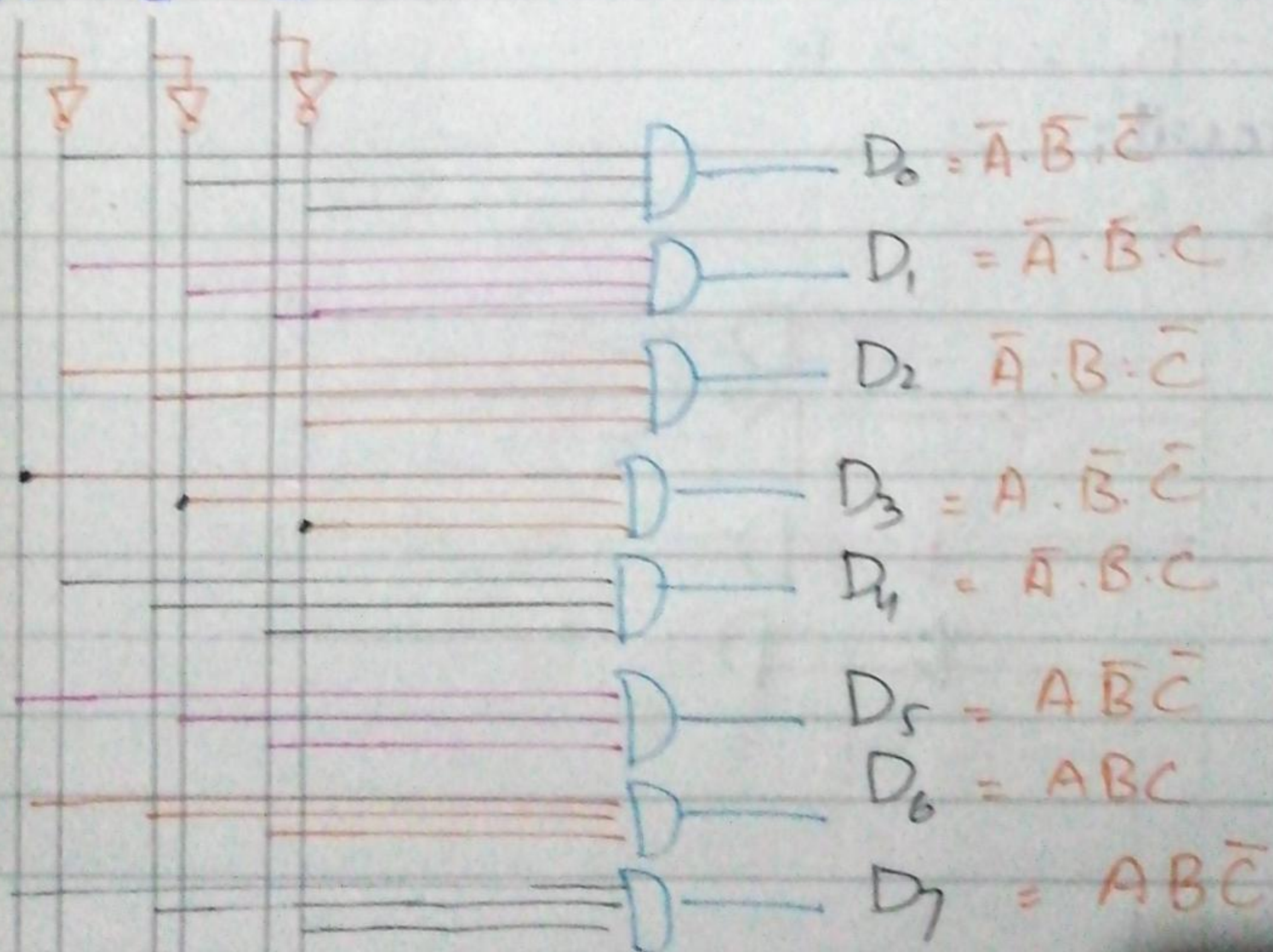


# Design and Implement 3 to 8

## Line Decoder.

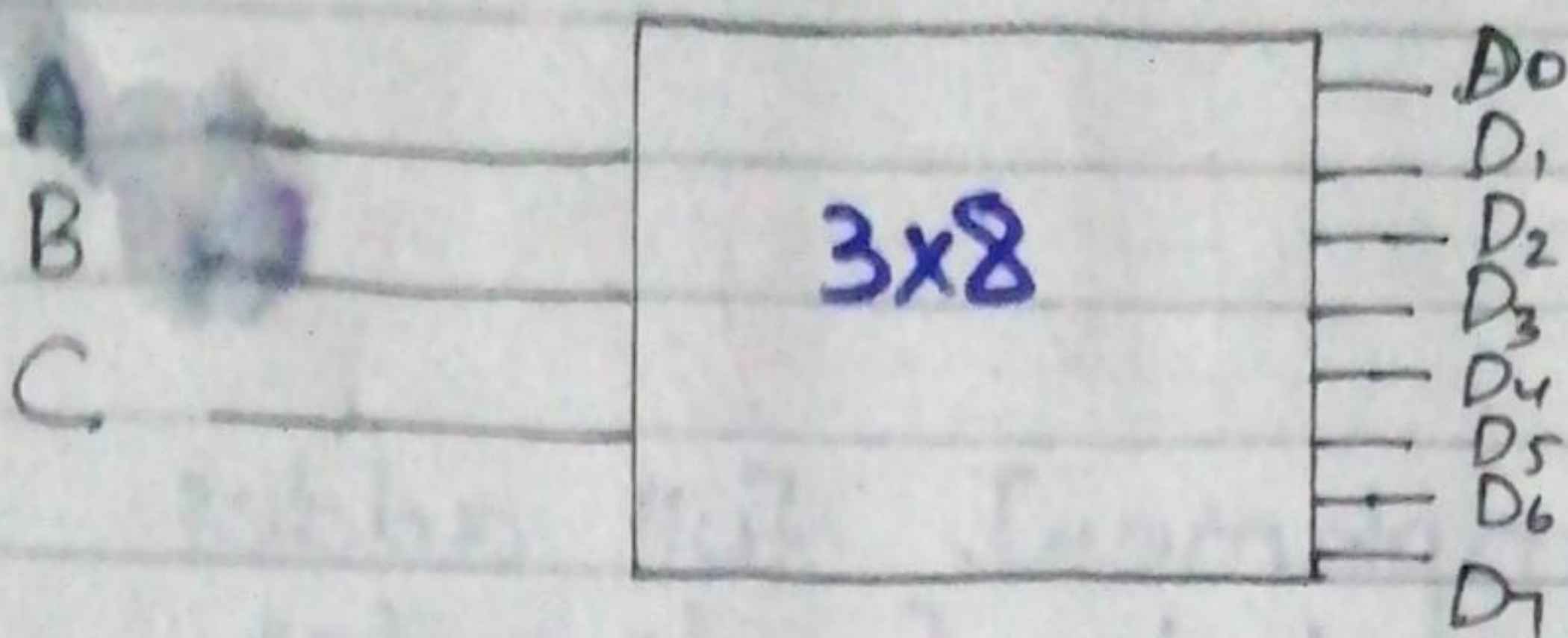
A	B	C	D <sub>0</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	D <sub>6</sub>	D <sub>7</sub>
0	0	0	1	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0	0
0	1	0	0	0	1	0	0	0	0	0
0	1	1	0	0	0	1	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0
1	0	1	0	0	0	0	0	1	0	0
1	1	0	0	0	0	0	0	0	1	0
1	1	1	0	0	0	0	0	0	0	1

A B C



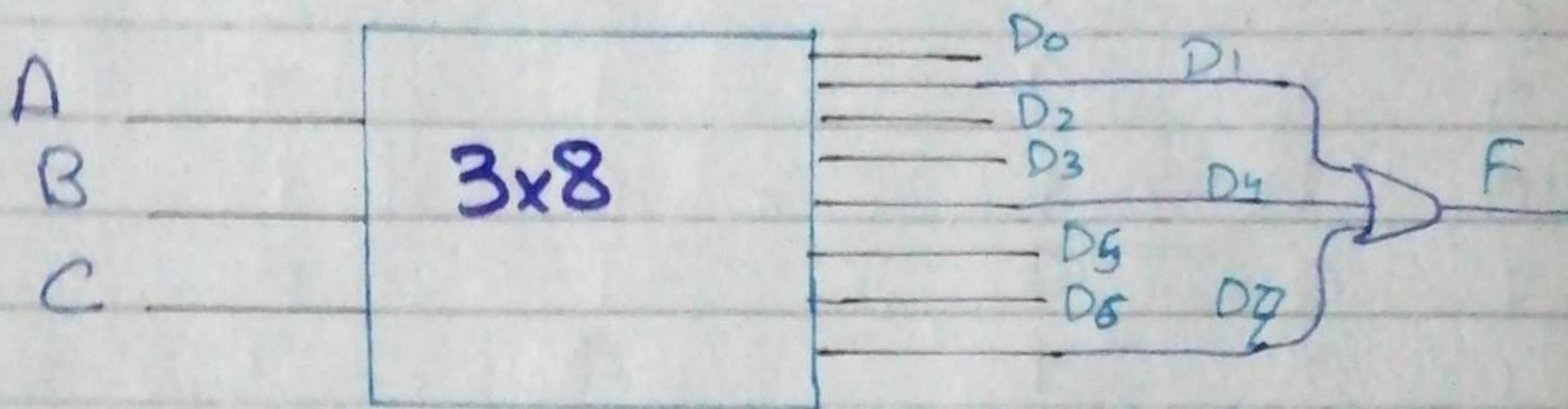


## 3x8 Line Decoder

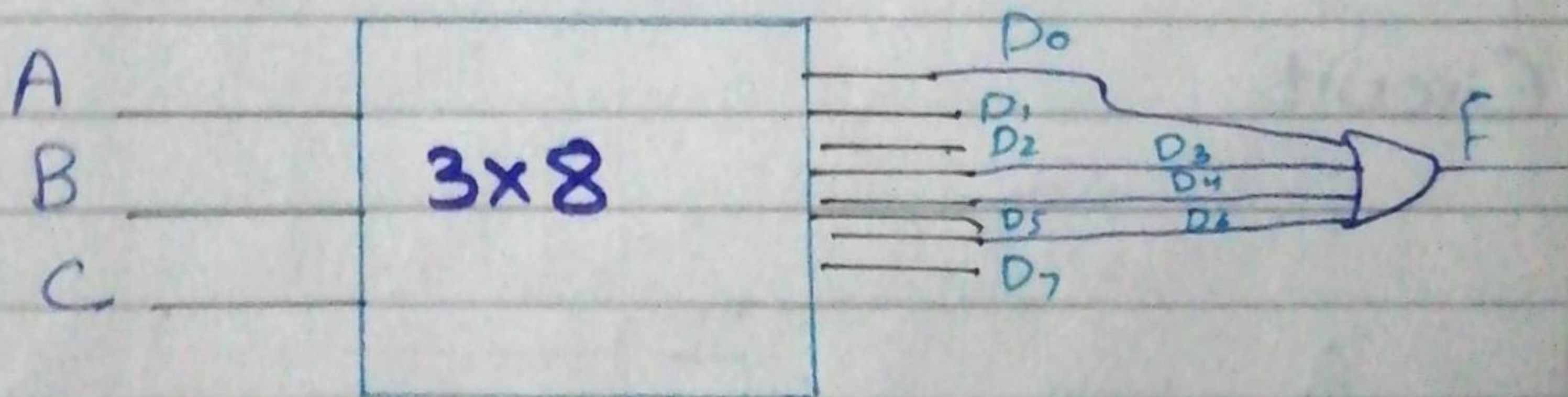


Example

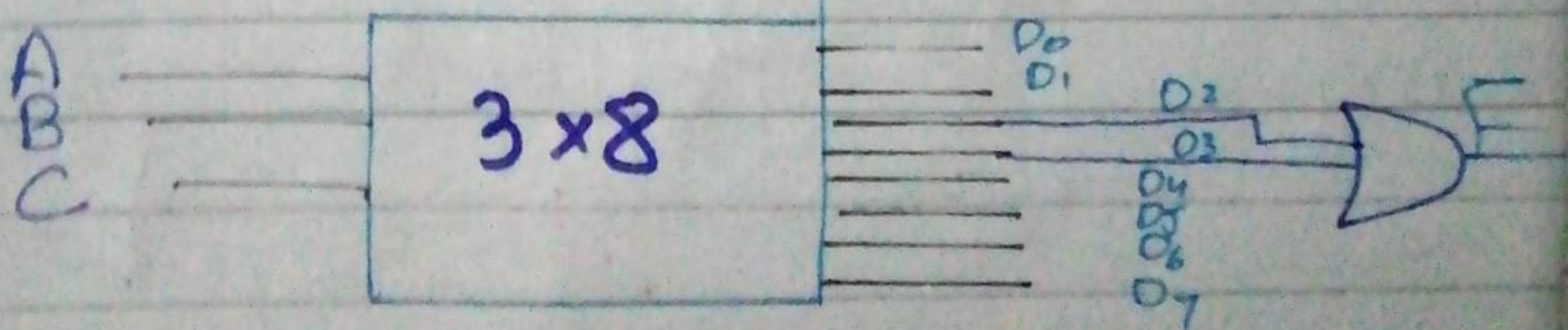
i)  $F(A, B, C) = \sum (1, 4, 7)$



ii)  $F(A, B, C) = \sum (0, 3, 4, 6)$

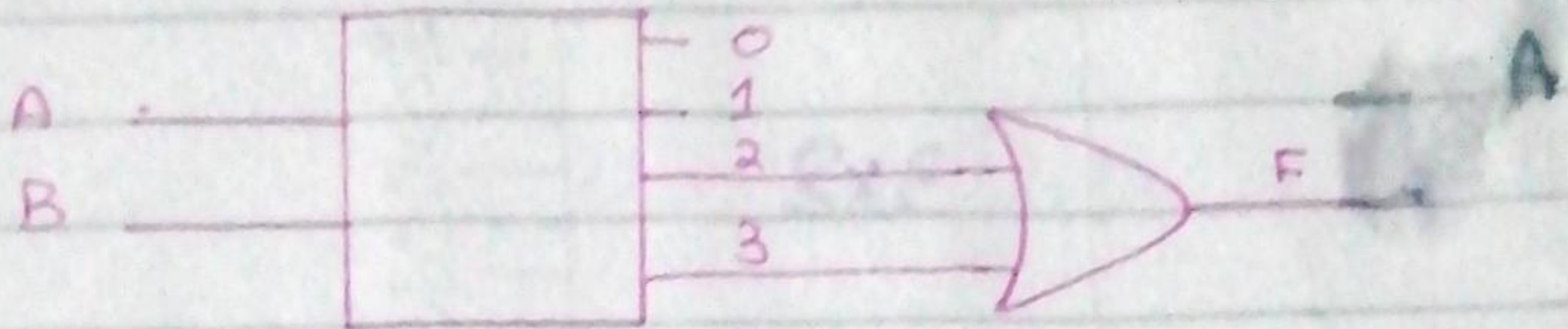


$F(A, B, C) = \sum (2, 3)$





$$F(A, B) = \sum (2, 3)$$



Design and implement full adder with the help of decoder.

A	B	carry	sum	carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

Circuit

