AKTU

GATEWAY CLASSES

Digital System Design

B.Tech. 3rd Sem

EC & Allied



Exam/Result Oriented Content

- ✓ Recorded Video Lectures
- ✓ Pdf Notes
- ✓ PYQs

DIGITAL SYSTEM DESIGN

UNIT 2 : Combinational circuits

Today's Target

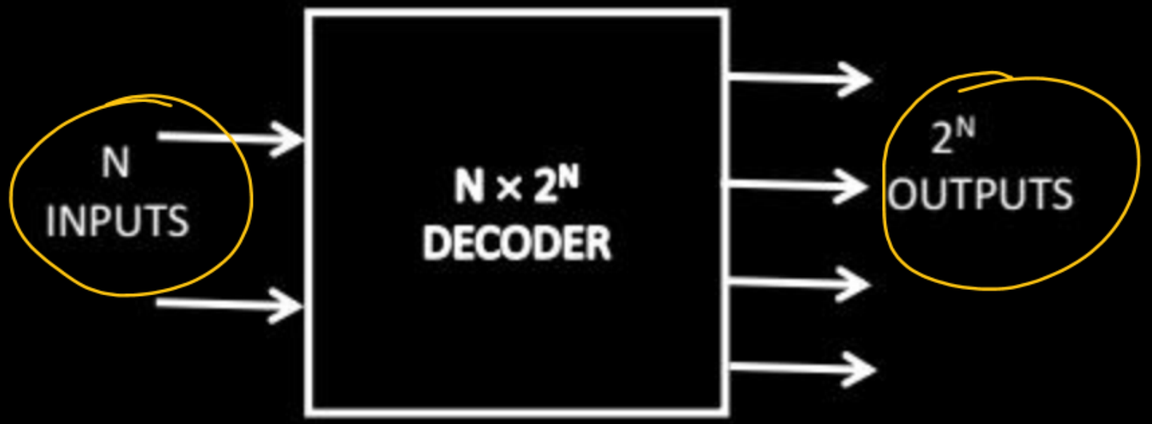
- Decoder
- Implementation of Higher-order Decoders
- Numerical Practice
- DPP
- University Questions

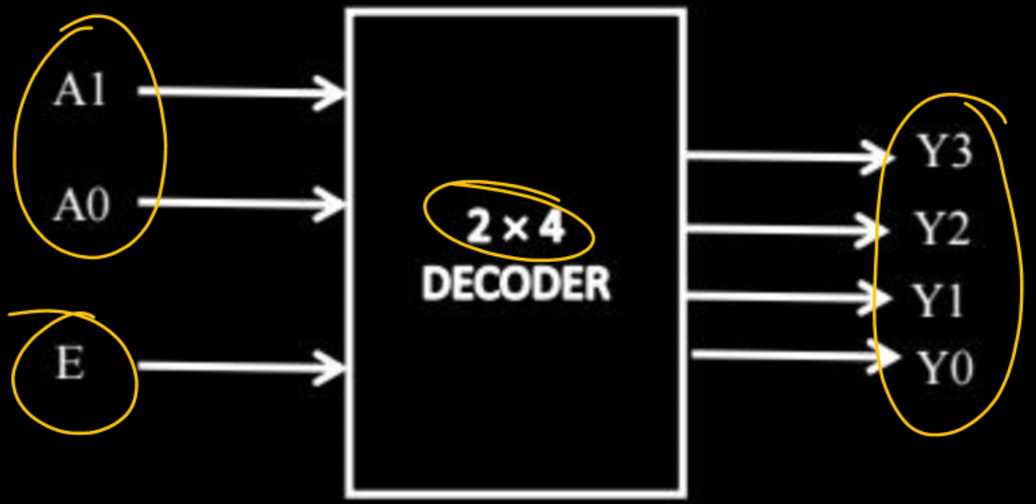
UNIVERSITY QUESTIONS

YEAR	QUESTION	MARKS
22-23	Explain Decoder with neat diagram. Implement the logic expression $Y = \Sigma m(2, 4, 6, 7)$ using decoder.	10 marks

DECODER

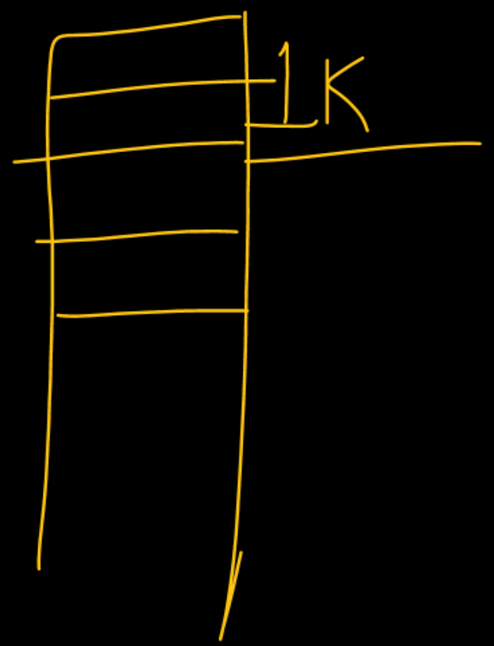
- a combinational logic circuit that converts binary information from the n coded inputs to a maximum of 2^n unique outputs.
- Some decoders also have one or more "enable" inputs.
- n input signals
- 2^n unique output signals





APPLICATIONS

- data multiplexing and data demultiplexing ✓
- seven segment displays ✓
- Address decoders for memory ✓
- Address decoders for port mapped I/O ✓

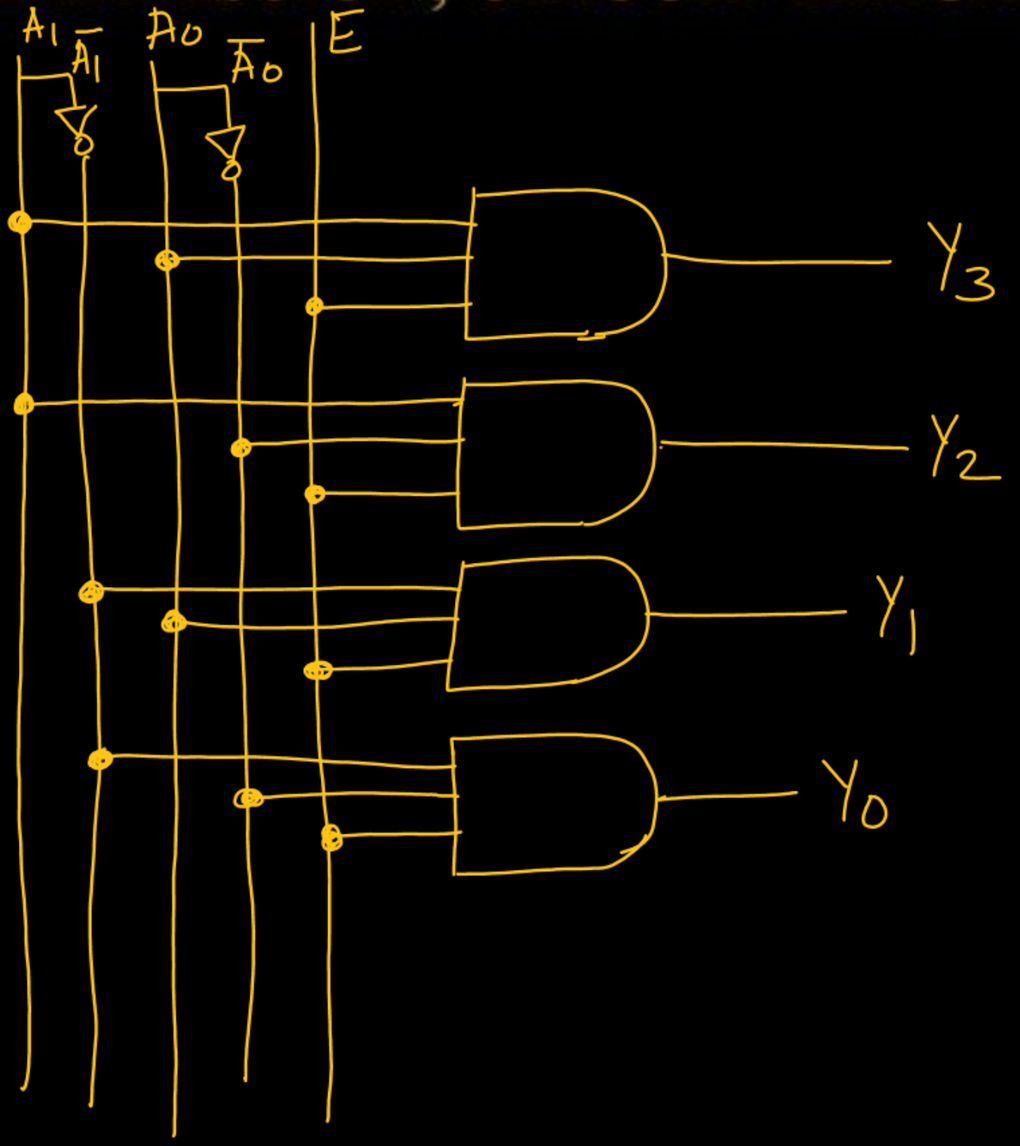


TRUTH TABLE, BOOLEAN EXPRESSION, CIRCUIT DIAGRAM

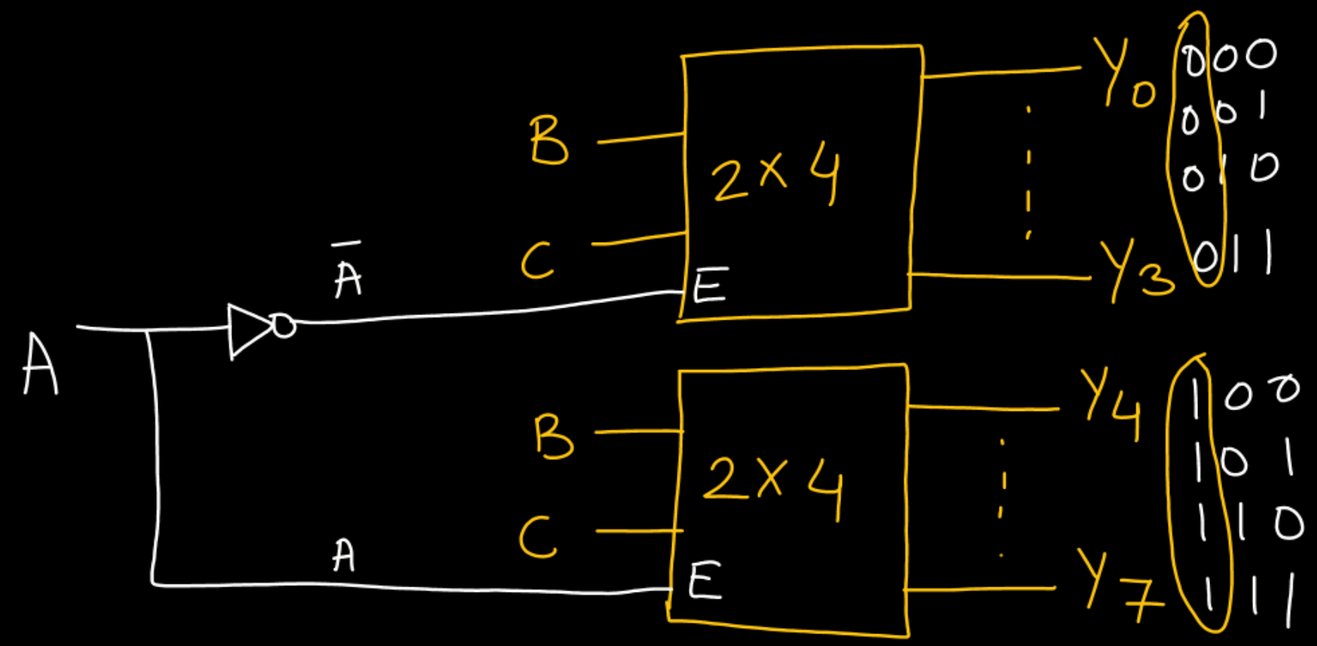
ENABLE	INPUTS		OUTPUTS			
E	A1	A0	Y3	Y2	Y1	Y0
0	X	X	0	0	0	0
1	0	0	0	0	0	1
1	0	1	0	0	1	0
1	1	0	0	1	0	0
1	1	1	1	0	0	0

$Y_3 = A_1 A_0 E$ $Y_1 = \bar{A}_1 A_0 E$

$Y_2 = A_1 \bar{A}_0 E$ $Y_0 = \bar{A}_1 \bar{A}_0 E$



Implementing 3×8 line Decoder by using 2×4 decoders



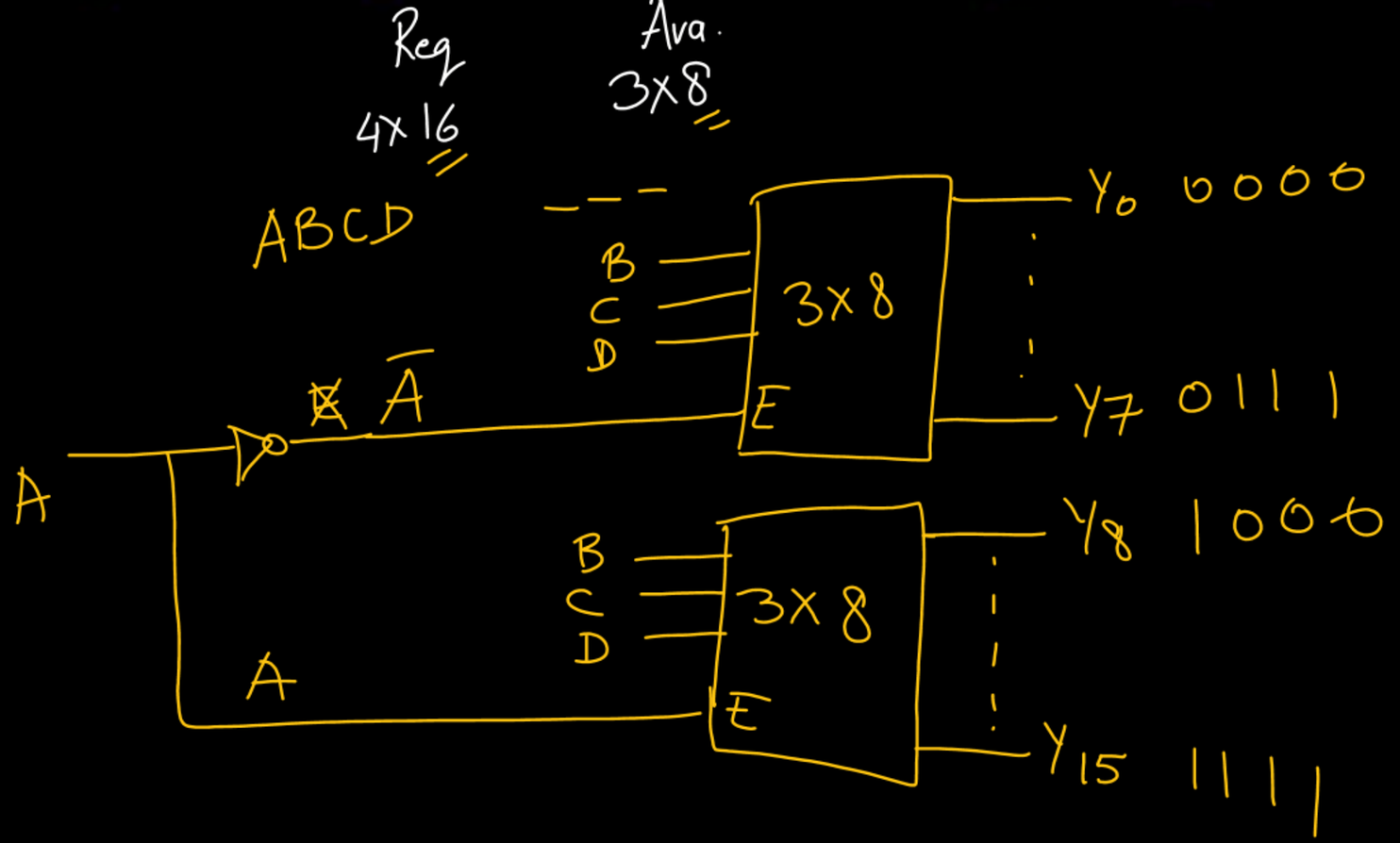
0	0	0
0	0	1
0	1	0
0	1	1

1	0	0
1	0	1
1	1	0
1	1	1

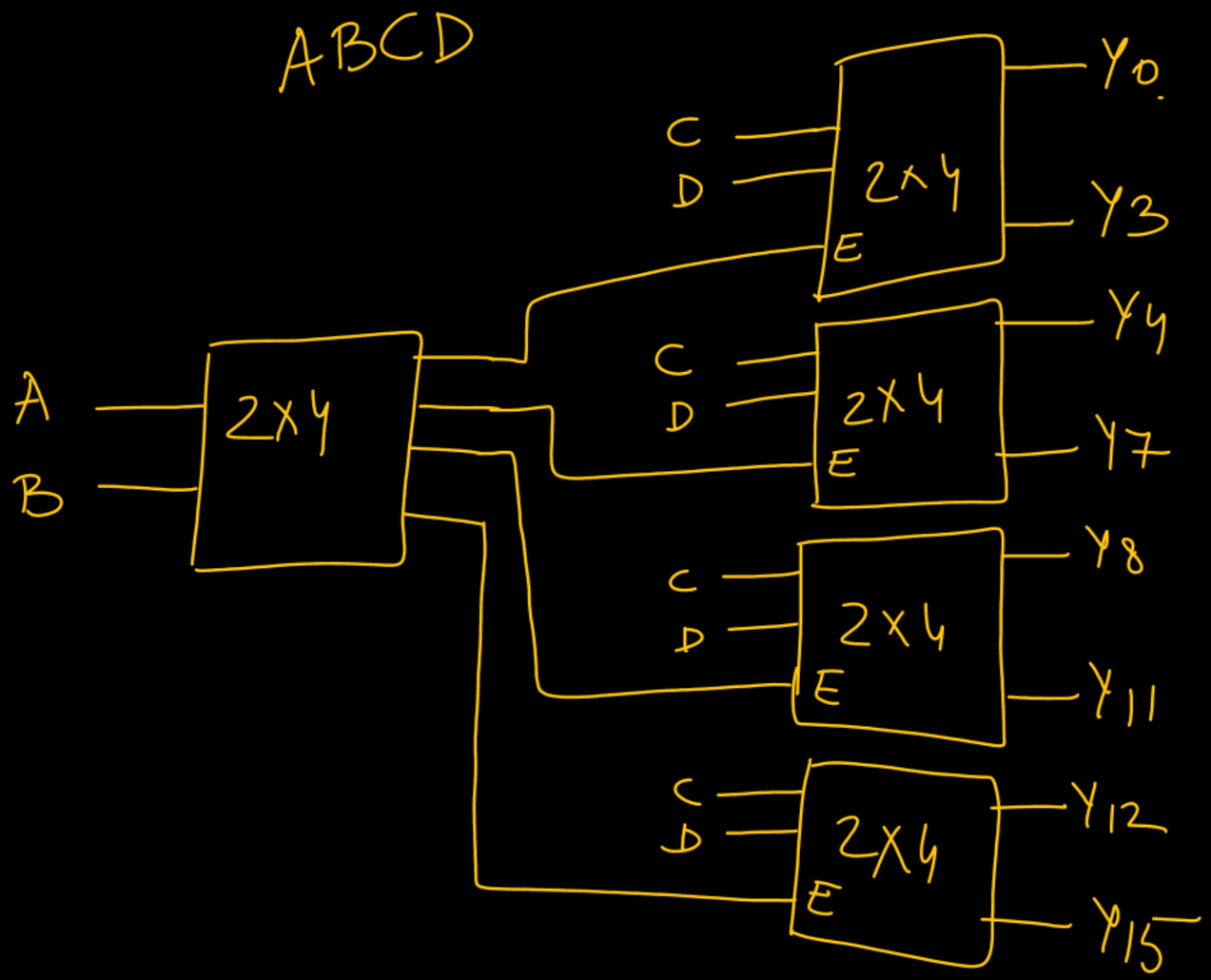
Req.
3×8
A B C

Available
2×4
B C

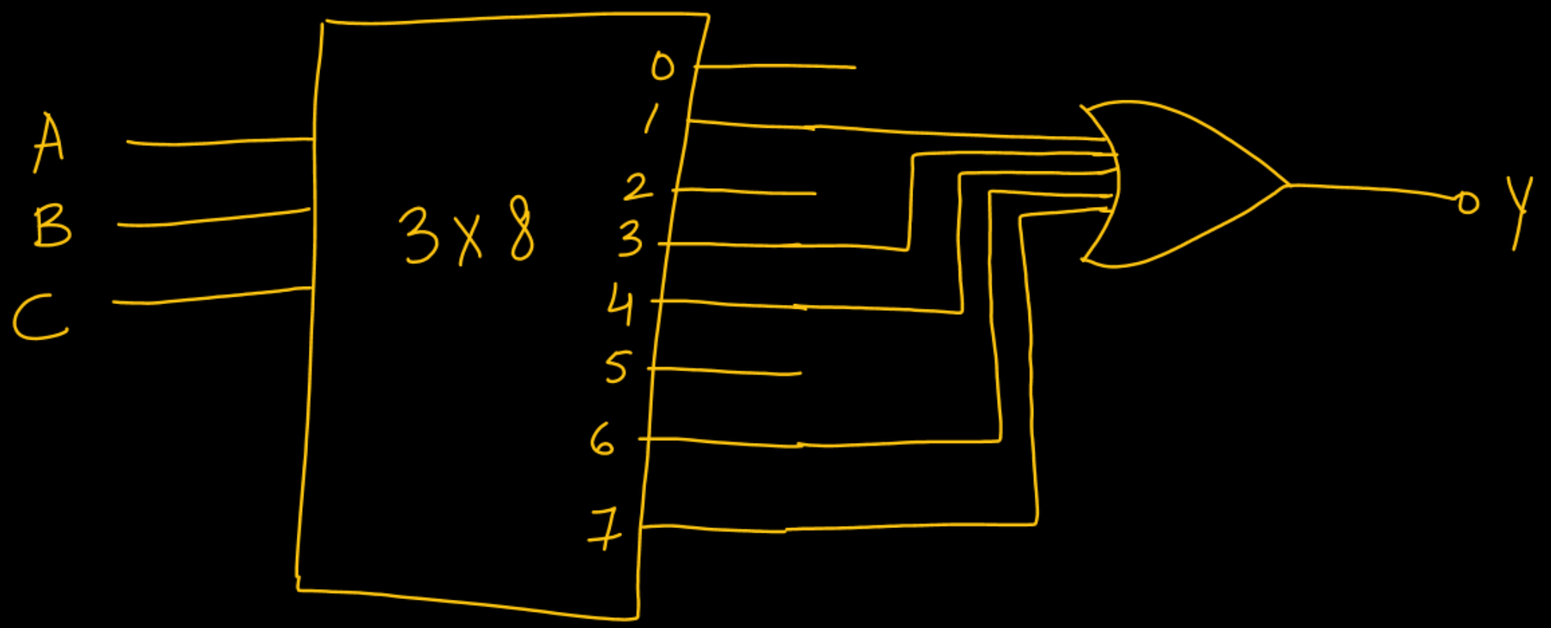
Implementing 4×16 line Decoder by using 3×8 decoders



4×16 line Decoder using 2×4 decoders



Implement the logic expression $Y=\Sigma m(1,3,4,6,7)$ using decoder.

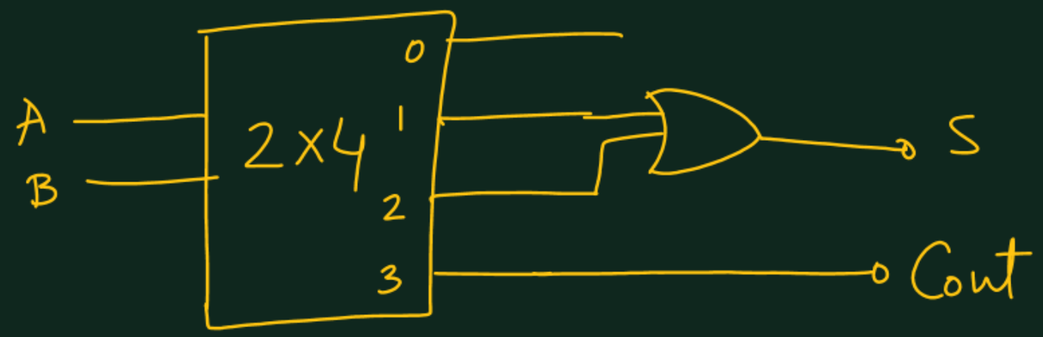


Half Adder using Decoder

A	B	S	Cout
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

$S = \Sigma m(1, 2)$

$Cout = \Sigma m(3)$

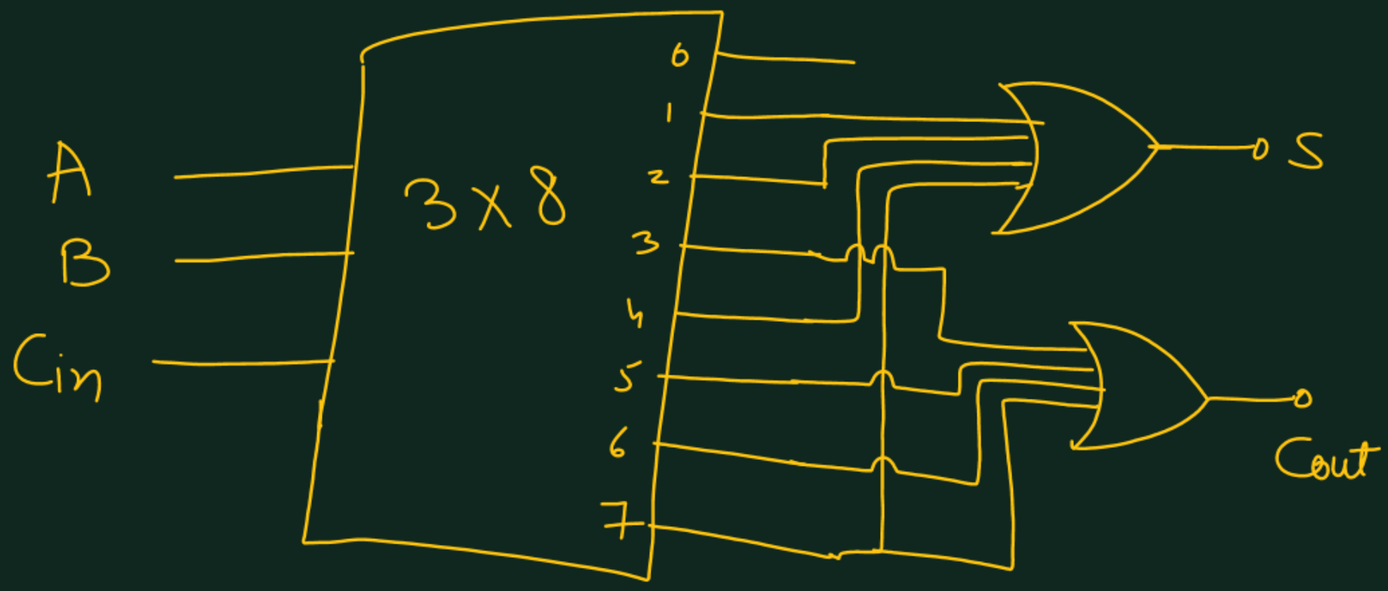


Full Adder

A	B	Cin	S	Cout
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

$S = \Sigma m(1, 2, 4, 7)$

$Cout = \Sigma m(3, 5, 6, 7)$



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a) Implement the logic expression $Y = \Sigma m(0,2,3)$ using decoder.

b) Implement the half adder using decoder.

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All Subjects

Link in Description

Thank You

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