

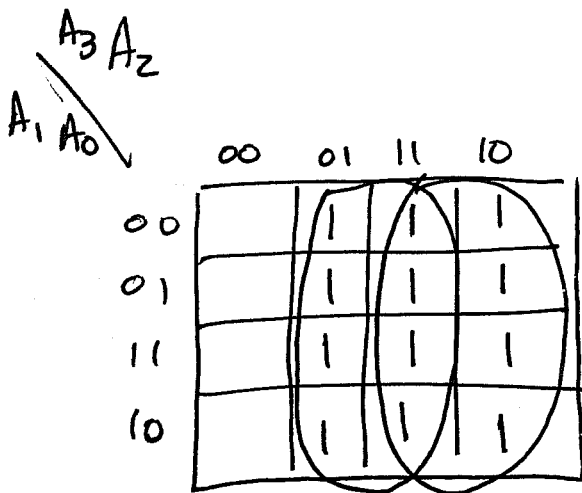
PRIORITY Encoder

4-bit inputs

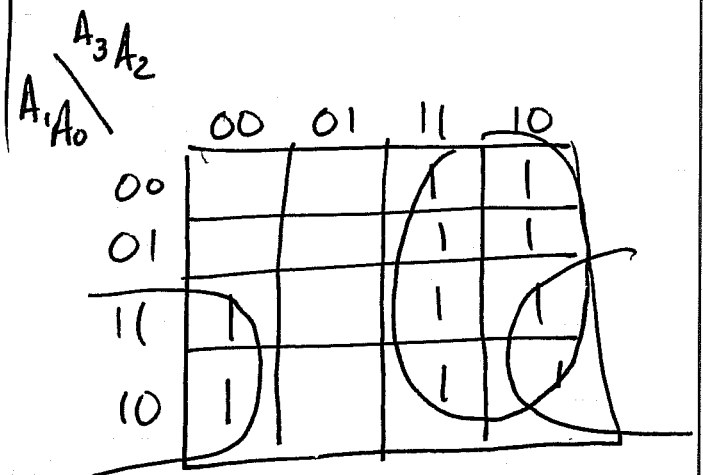
$2^N \rightarrow N=2$ bit outputs

A_3	A_2	A_1	A_0
1	X	X	X
0	1	X	X
0	0	1	X
0	0	0	1
0	0	0	0

$Y_{1:0}$	$NONE_y$
11	0
10	0
01	0
00	0
00	1



$$Y_1 = A_2 + A_3$$



$$Y_0 = A_3 + \bar{A}_2 A_1$$

$$NONE_y = \bar{A}_3 \cdot \bar{A}_2 \cdot \bar{A}_1 \cdot \bar{A}_0$$

3-0235 — 50 SHEETS — 5 SQUARES
 3-0236 — 100 SHEETS — 5 SQUARES
 3-0237 — 200 SHEETS — 5 SQUARES
 3-0137 — 200 SHEETS — FILLER

COMET

A_3	A_2	A_1	A_0
1	0	0	0
0	1	0	0
0	0	1	0
0	0	0	1
0	0	0	0
1	1	X	X
1	0	1	X
1	0	0	1
0	1	X	X
0	1	0	1
0	0	1	1

Z_1	Z_0	NONE _Z
0	0	1
0	0	1
0	0	1
0	0	1
0	0	1
1	0	Φ
0	1	0
0	0	0
0	1	0
0	0	0
0	0	0

$A_3 A_2$	00	01	11	10
00			1	
01			1	
11			1	
10			1	

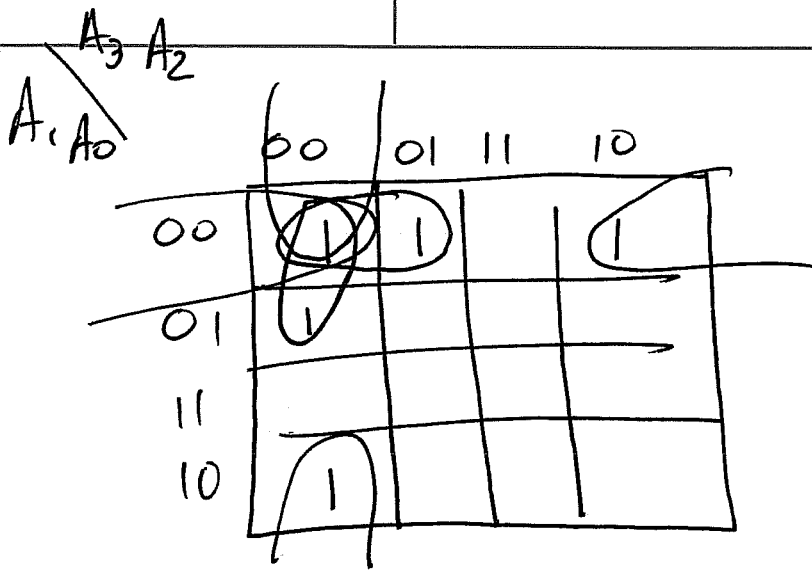
$$Z_1 = A_3 \cdot A_2$$

$A_3 A_2$	00	01	11	10
00				
01				
11	1			
10				1

$$Z_0 = A_3 \bar{A}_2 A_1 + \bar{A}_3 A_2 A_1$$

XOR

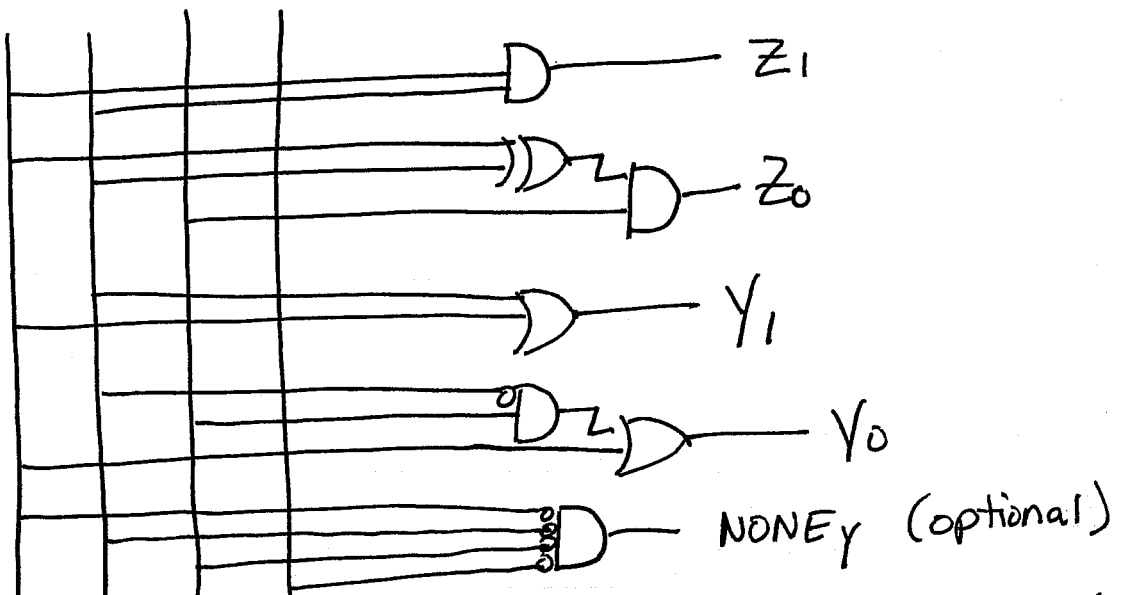
3-0236 — 50 SHEETS — 5 SQUARES
 3-0236 — 100 SHEETS — 5 SQUARES
 3-0237 — 200 SHEETS — 5 SQUARES
 3-0137 — 200 SHEETS — FILLER



$$\begin{aligned}
 \text{NONE}_Z &= \bar{A}_3 \bar{A}_1 \bar{A}_0 + \bar{A}_3 \bar{A}_2 \bar{A}_1 + \\
 &\quad \bar{A}_3 \bar{A}_2 \bar{A}_0 + \bar{A}_2 \bar{A}_1 \bar{A}_0
 \end{aligned}$$

$$= \bar{A}_3 \bar{A}_2 (\bar{A}_1 + \bar{A}_0) + (\bar{A}_3 \bar{A}_1 + \bar{A}_2 \bar{A}_1) \bar{A}_0$$

A₃ A₂ A₁ A₀



NONE_Z not shown (optional)

critical path is defined as worst-case path for complete circuit. Assuming, we do not include this analysis for $NONE_Y$ or $NONE_Z$

critical path is through XOR \rightarrow AND
or $A_3, A_2 \rightarrow Z_0$ or

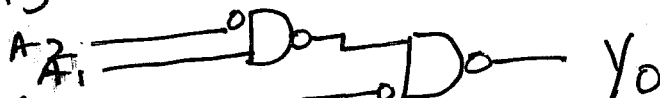
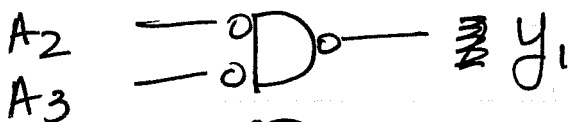
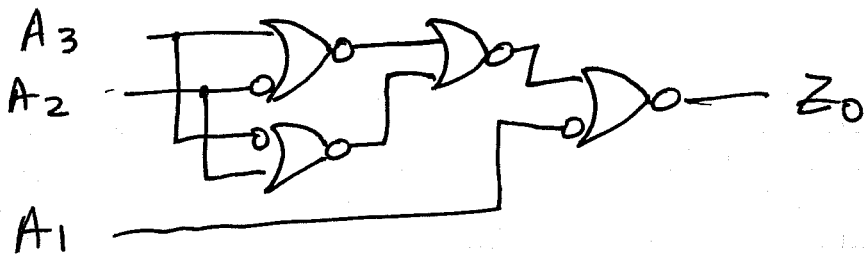
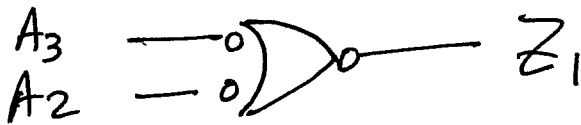
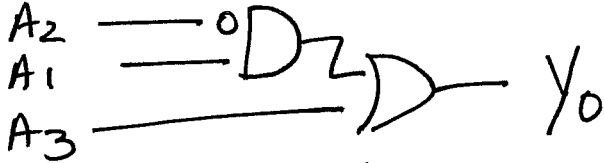
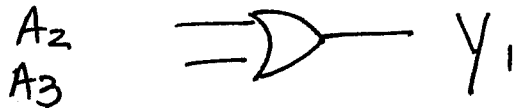
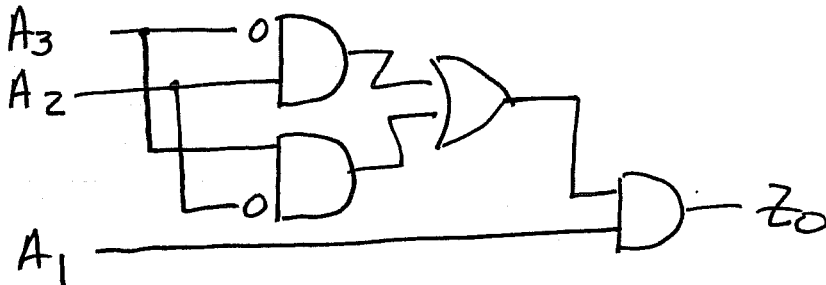
$$60 \text{ ps} + 30 \text{ ps} = 90 \text{ ps}$$

The ~~critical~~ contamination delay is the shortest path for the complete circuit

or $A_3, A_2 \rightarrow Z_1$ [also same
through $A_3, A_2 \rightarrow Y_1$]

or 30 ps

The next part involves using De Morgan's Theorem to convert any AND/OR gates into NAND/NOR gates



Always start at output and work towards input

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COMET

Critical path

$$A_2 \rightarrow Z_0$$

$$\text{NOT} \rightarrow \text{NOR}(2) \rightarrow \text{NOR}(2) \rightarrow \text{NOR}(2)$$

$$15_{\text{ps}} + 3(45 \text{ ps}) = 150 \text{ ps}$$

$$\begin{array}{r} 1 \\ 45 \\ \underline{3} \\ 135 \\ \underline{15} \\ 150 \end{array}$$

Contamination delay

$$A_2 \rightarrow y_1$$

$$\text{NOT} \rightarrow \text{NAND}(2)$$

$$10 \text{ ps} + 15 \text{ ps} = 25 \text{ ps}$$

↑
Notice that this is longer than previous answer, but we use less type of gates.