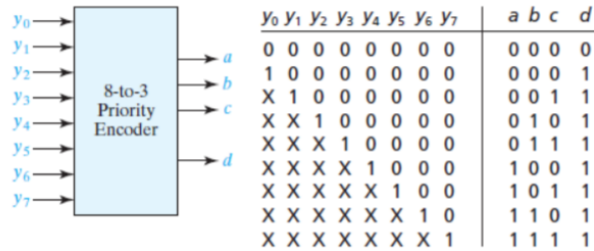


Problem I

- 1) Show how to make the 8-to-3 priority encoder representing the picture below using two 4-to-2 priority encoders and any additional necessary gates (5 pts)



Benjamin Ruddy

Problem I – Encoder, Decoder

1. $y_0, y_1, y_2, \dots, y_7$ | a, b, c, d

0	0	0	...	0	0	0	0	
1	0	0	...	0	0	0	1	m_1
X	1	0	...	0	0	0	1	m_2
X	X	1	...	0	0	1	1	m_3
X	X	X	...	0	1	0	1	m_4
X	X	X	...	1	1	1	1	m_7

$m_1, \text{ thru } m_4$ start w/ 0: 000, 001, 010, 011
 $m_5, \text{ thru } m_8$ start w/ 1: 100, 101, 110, 111

8-3 decoder

*Note: we assume the truth table for our 4-3 decoders is:

D_3	D_2	D_1	D_0	$x_1/x_0/V$
0	0	0	0	X X 0
0	0	0	1	0 0 1

0	0	1	x	0	1	1
0	1	x	x	1	0	1
1	x	x	x	1	1	1

- 2) Realize a full subtracter using a 3-to-8 line decoder with inverting outputs and
- two NAND gates (3 pts)
 - two AND gates (3 pts)

a) Using $Z = \text{carry in}$
3 to 8 Line Decoder

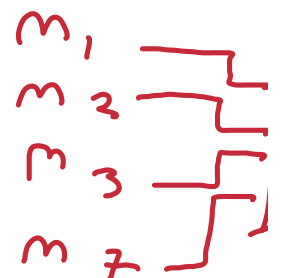
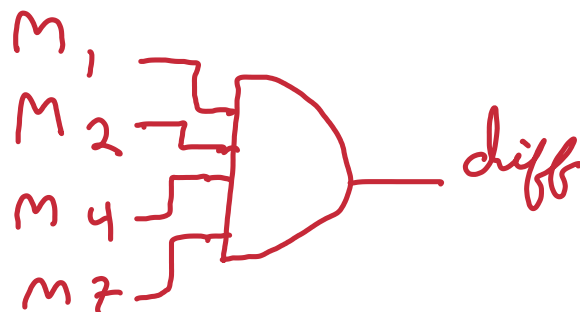
* $m = \text{max term}$

Inputs			Outputs									
x	y	z	D0	D1	D2	D3	D4	D5	D6	D7	diff	borrow
0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0	0	1	1
0	1	0	0	0	1	0	0	0	0	0	1	1
0	1	1	0	0	0	1	0	0	0	0	0	1
1	0	0	0	0	0	0	1	0	0	0	1	0
1	0	1	0	0	0	0	0	1	0	0	0	0
1	1	0	0	0	0	0	0	0	1	0	0	0
1	1	1	0	0	0	0	0	0	0	1	1	1

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e.g. $xyz = 010 \Rightarrow \text{maxterm} = (\bar{x} \cdot y \cdot \bar{z})$

AND's:



NAND's:

.....,

