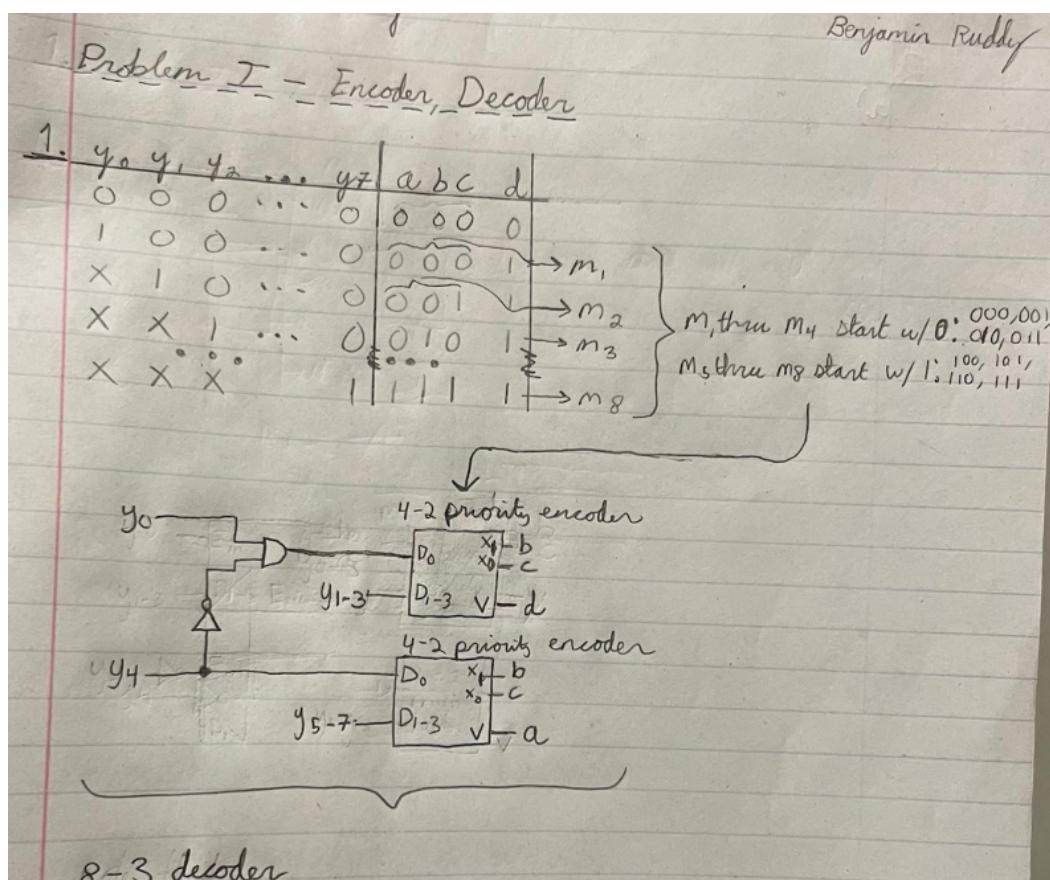


# Problem I

- 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)

$y_0$	$y_1$	$y_2$	$y_3$	$y_4$	$y_5$	$y_6$	$y_7$	$a$	$b$	$c$	$d$
0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	1
X	1	0	0	0	0	0	0	0	0	1	1
X	X	1	0	0	0	0	0	0	1	1	1
X	X	X	1	0	0	0	0	1	0	0	1
X	X	X	X	1	0	0	0	1	0	1	1
X	X	X	X	X	1	0	0	1	1	0	1
X	X	X	X	X	X	1	0	1	1	1	1



\*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

$$\begin{array}{ccc|cc}
 & & & 0 & 1 \\
 & & & 0 & 1 \\
 & & & 1 & 1
 \end{array}
 \quad
 \begin{array}{ccc|cc}
 & & & 0 & 1 \\
 & & & 1 & 0 \\
 & & & 1 & 1
 \end{array}$$

- 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  $\bar{z} = \text{carry}$

3 to 8 Line Decoder

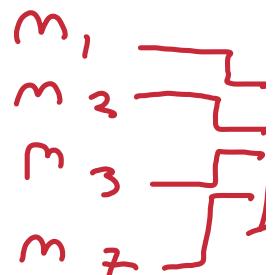
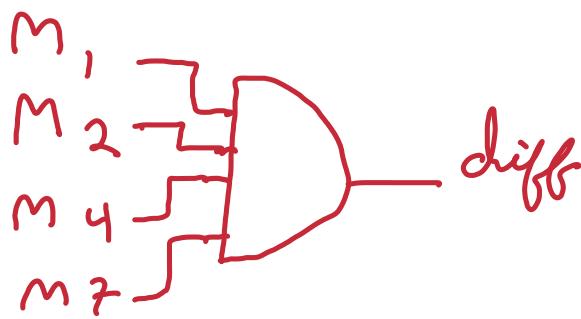
\*  $m = \text{Max term}$

Inputs	Outputs								diff	borrow			
	x	y	z	D0	D1	D2	D3	D4	D5	D6	D7		
$M_0$	0	0	0	1	0	0	0	0	0	0	0	0	0
$M_1$	0	0	1	0	1	0	0	0	0	0	0	1	1
$M_2$	0	1	0	0	0	1	0	0	0	0	0	1	1
$M_3$	0	1	1	0	0	0	1	0	0	0	0	0	1
$M_4$	1	0	0	0	0	0	0	1	0	0	0	1	0
$M_5$	1	0	1	0	0	0	0	0	1	0	0	0	0
$M_6$	1	1	0	0	0	0	0	0	0	1	0	0	0
$M_7$	1	1	1	0	0	0	0	0	0	0	1	1	0

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

AND's:



NAND's

