$$Y = X_2 \cdot \overline{X}_1 \cdot X_0 + \overline{X}_2 \cdot X_1 \cdot \overline{X}_0 + X_1 \cdot X_0 (X_2 + \overline{X}_2)$$

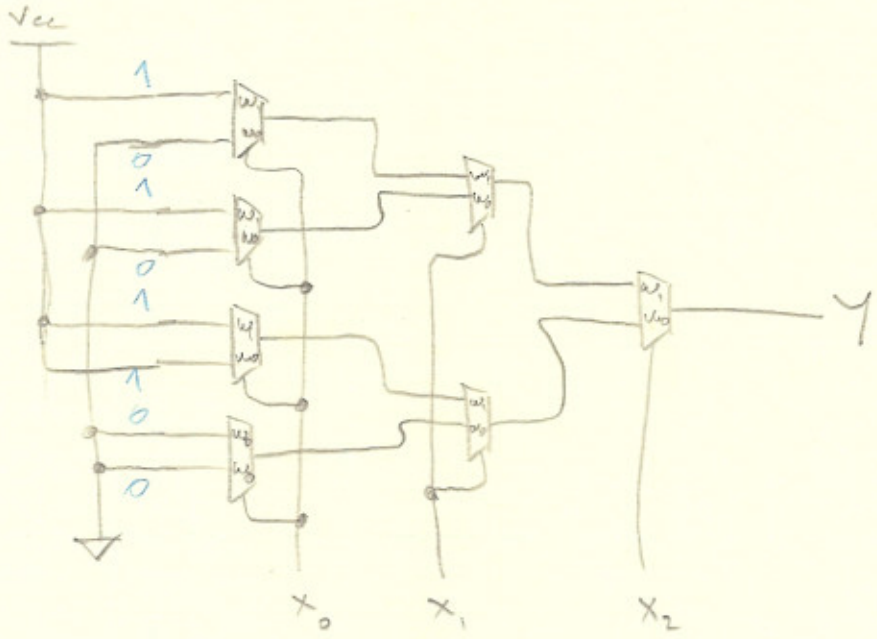
as not to make mistakes.

X_2	X_1	X_0	Y
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

Using 2-to-1 multiplexers

S_0	f
0	w_0
1	w_1

* must draw this for full marks.

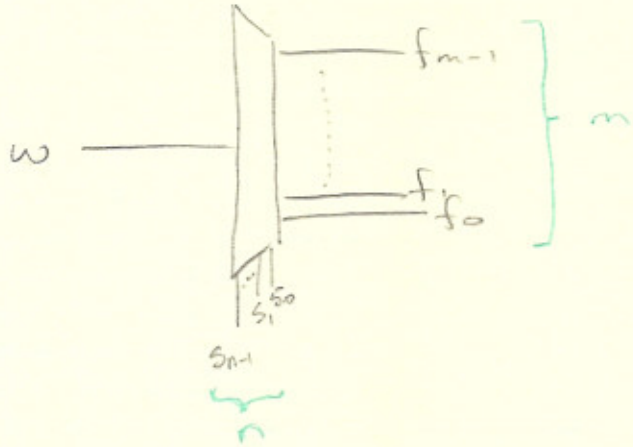


Note:

no electrical connection

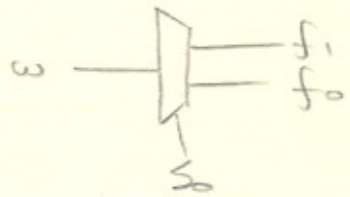
electrical connection.

Demultiplexer



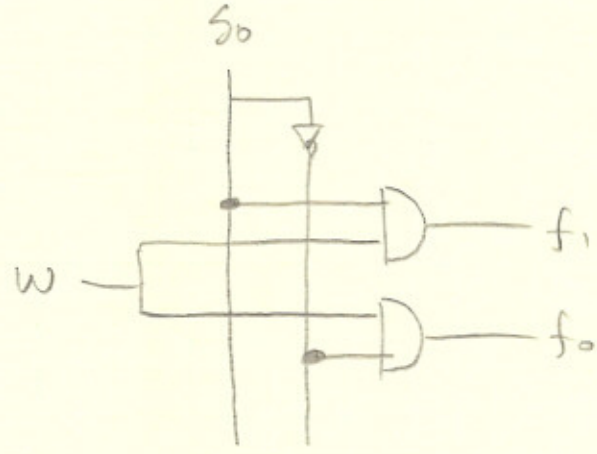
$m = 2^n$

1-to-2 multiplexer

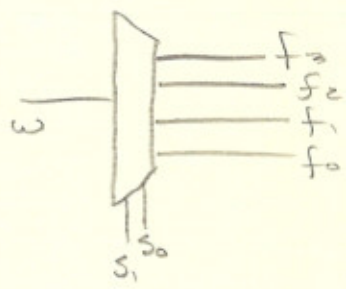


S_0	f_1	f_0
0	z	w
1	w	z

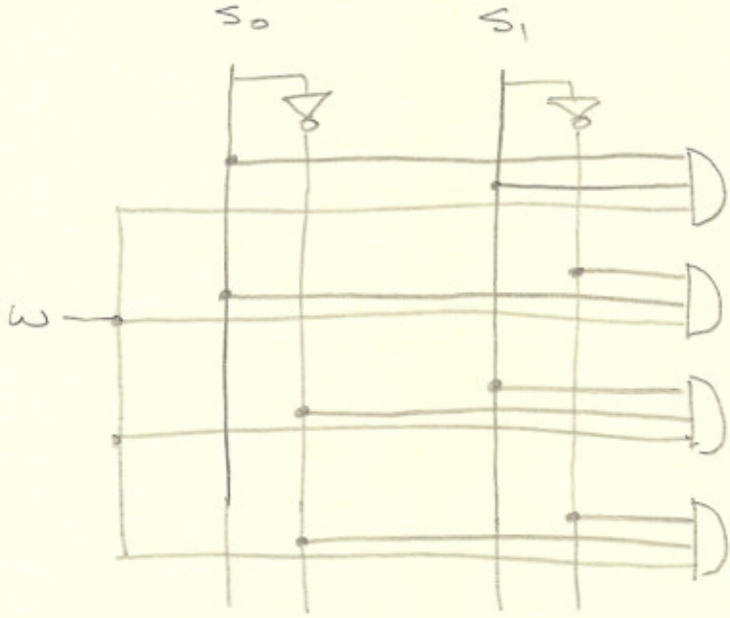
instead of zero b/c of the organization of the AND gate.



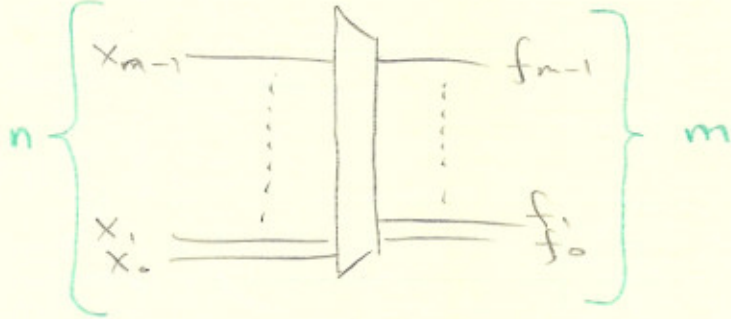
4-to-1 multiplexer



S_0	S_1	f_0	f_1	f_2	f_3
0	0	w	z	z	z
1	0	z	w	z	z
0	1	z	z	w	z
1	1	z	z	z	w



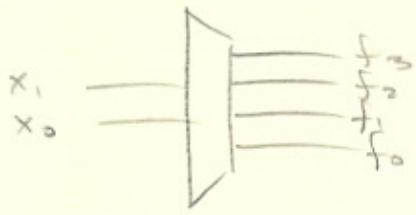
Decoder



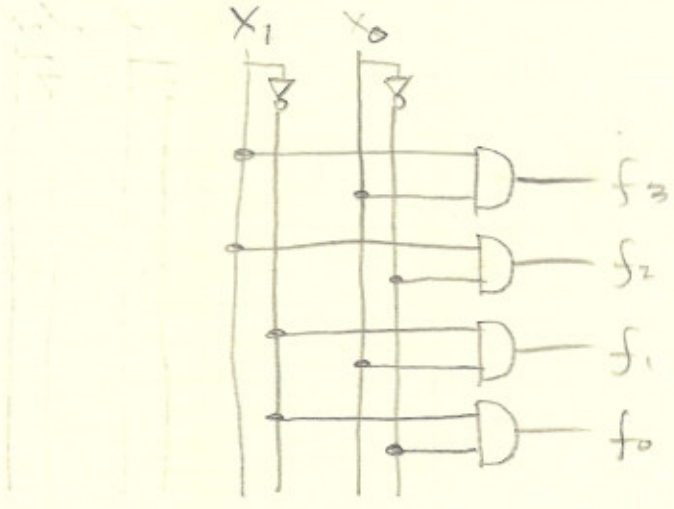
$n \leq 2^n$

X_{n-1}	X_1	X_0	f_{m-1} ...	f_1	f_0
0	0	0	0	0	1
0	0	1	0	1	0
1	1	1	1	0	0

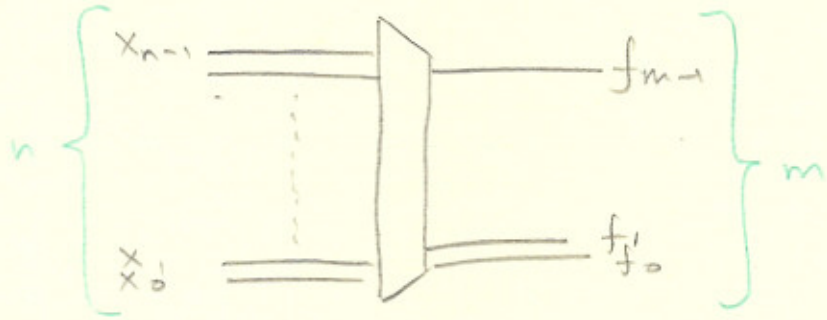
EX



X_1	X_0	f_3	f_2	f_1	f_0
0	0	0	0	0	1
0	1	0	0	1	0
1	0	0	1	0	0
1	1	1	0	0	0

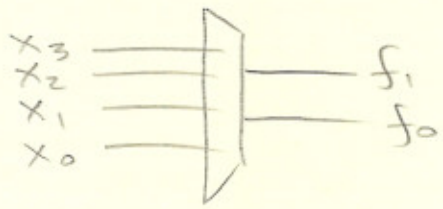


Encoder



$n \leq 2^m$

EX



x_3	x_2	x_1	x_0	f_1	f_0
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1