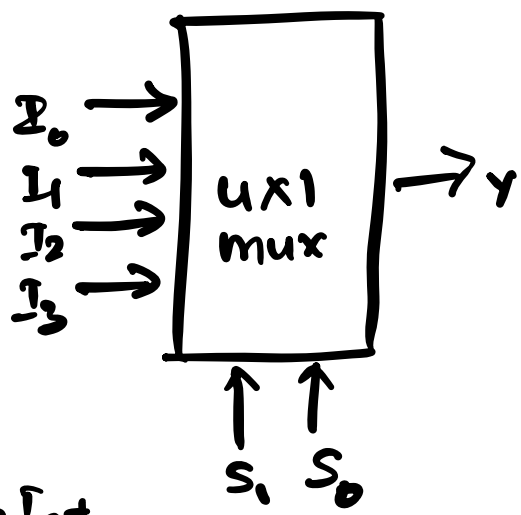
Multiplexers:

2^n inputs, 1 output, n selection signals

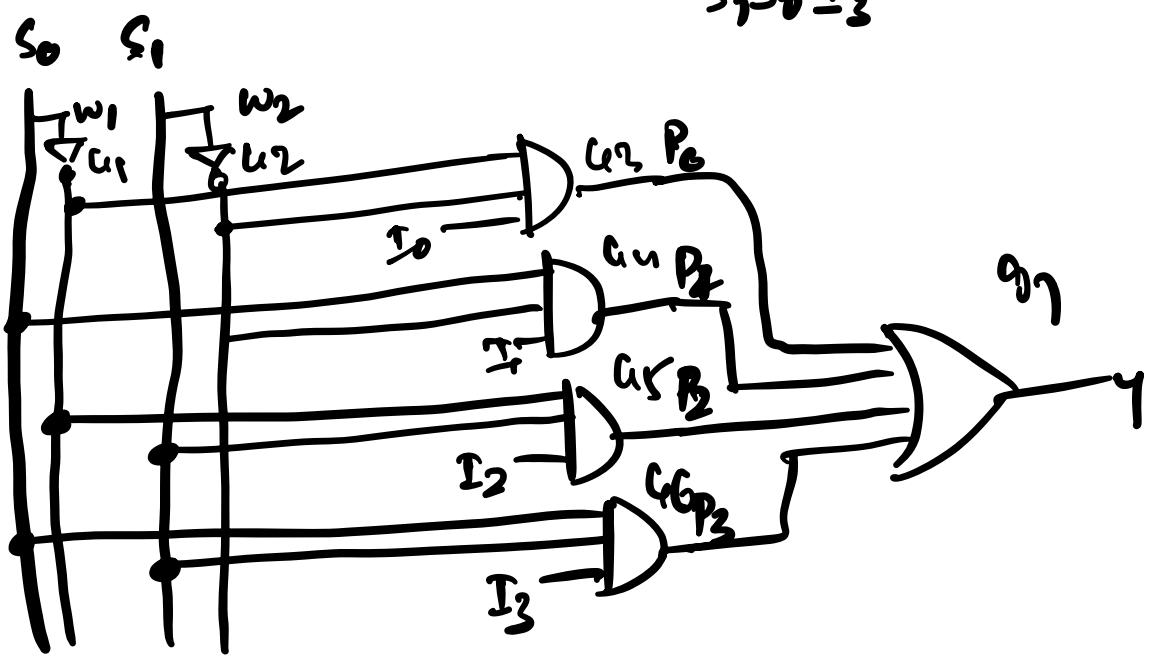
Ex:- 4x1 mux 2^2 → selection lines

inputs → o/p's

S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3



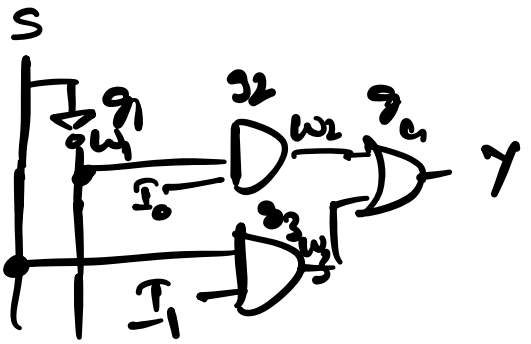
$Y = \bar{S_0}\bar{S_1}I_0 + \bar{S_1}S_0I_1 + S_1\bar{S_0}I_2 + S_1S_0I_3$

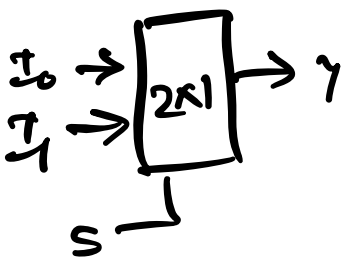


2x1 mux:

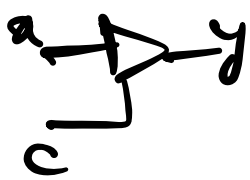
$y = \bar{S} I_0 + S I_1$

S	y
0	I_0
1	I_1



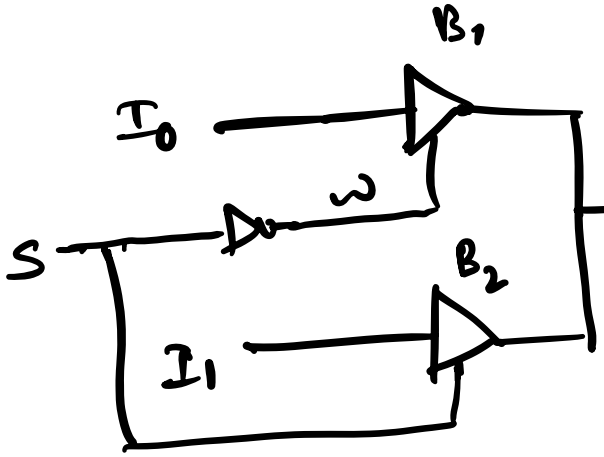


Using buffer:



c=1, y=a

c=0, y=z (high impedance)

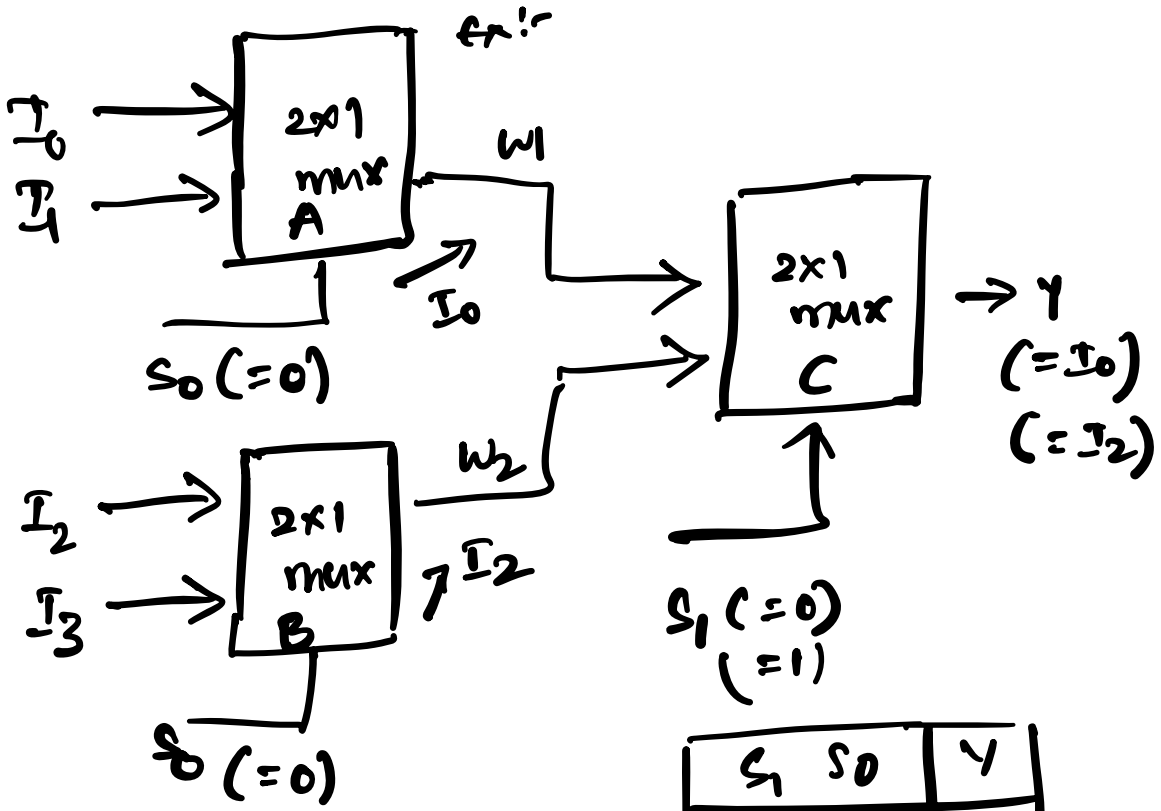


if S=0, y=I_0

if S=1, y=I_1

4x1 mux using 2x1 mux:-

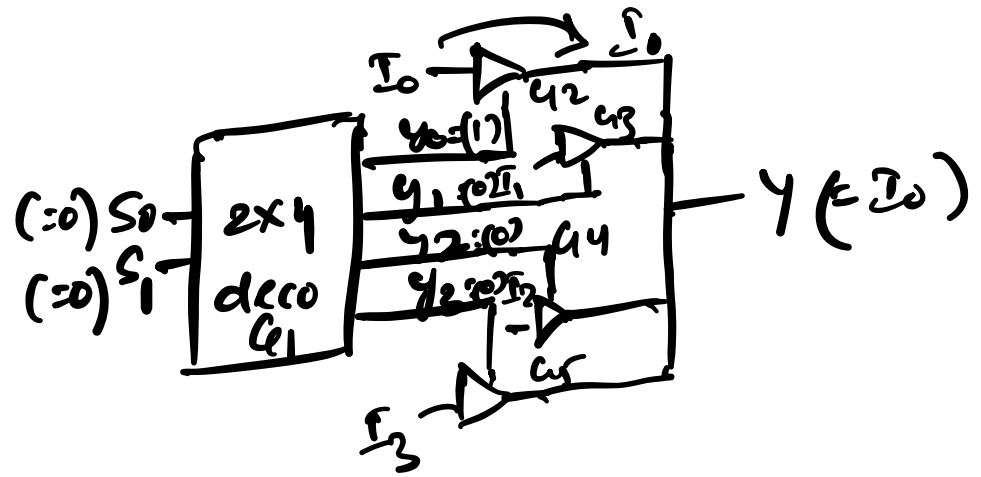
we need 3 2x1 mux's :-



S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

4X1 mux using buffer

We use 2x4 decoder




```
module mux_4x1(y, S, I)
output y;
input [3:0] I;
input [1:0] S;
wire [3:0] y
  decoder_2x4 d1([3:0] y, [1:0] S);
  bufif c2(y, I0, y[0]);
  bufif c3(y, I1, y[1]);
  bufif c4(y, I2, y[2]);
  bufif c5(y, I3, y[3]);
endmodule.
```

8x1 mux using 4x1 mux's