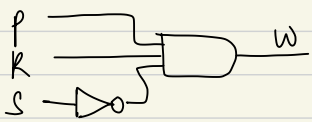
decoder, mux,
encoder, timing
diagram

Combinational Circuits

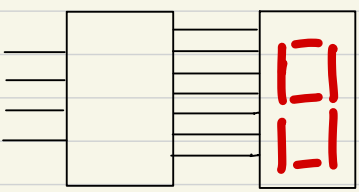
↳ ex. decoder, multiplexer etc.

↑ o/p doesn't depend on previous input values

task 1 $w = PRS'$



seven segment decoder

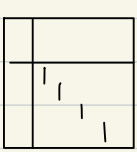


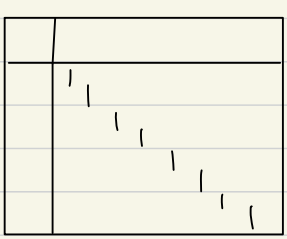
takes 4 bit inputs and shows its hexa counterpart

- n inputs, max 2^n outputs

decoder

- binary input and gives a one-hot output
- n inputs, def. 2^n outputs





internal design
- and gates for each output
- enable e (active high)

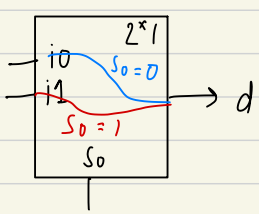
example 6 bit input → 1 bit output displays 1 bulb at a time and there's 60 in total

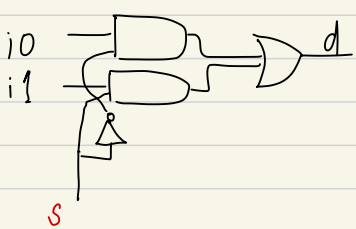
counts from 59 to 0

→ 6-bit = 2^6 = 64 ∴ enable e = 1 from 0 to 59
e = 0 from 60 to 64

multiplexer

- multiple inputs, single output, selection input
- at a time, only one input is connected to the output



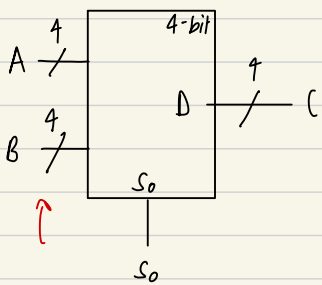


nx1 mux :
n inputs, $\log_2 n$ selection inputs, 1 output

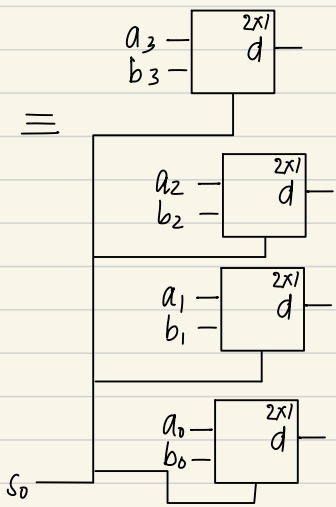
+91 9490118203

multi-bit inputs

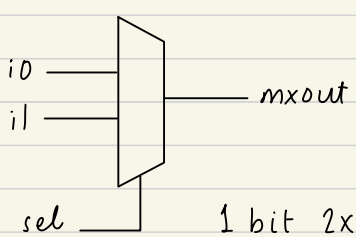
4 bit 2x1 mux



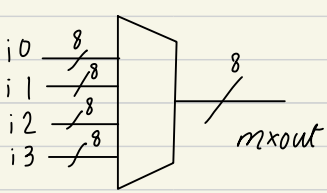
notation
4 bit bus
a3
a2
a1
a0



at a time, only A or B is displayed

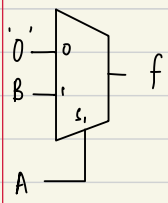


1 bit 2x1 mux



8 bit 4x1 mux

A	B	f
0	0	
0	1	
1	0	B
1	1	B



A	f
0	0
1	B

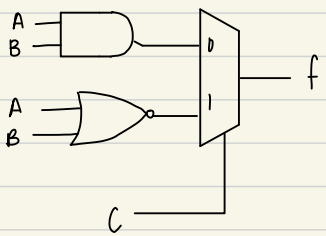
2-input AND gate

(1)
(6)

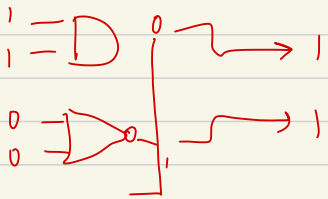
A	B	C	F
0	0	1	1
1	1	0	1

0 1
0 → 0
1 1

∴ NOT



A	B	C	F
0	0	1	1
1	1	0	1



timing diagrams

- show behavior of circuit with progression of time
- input values are changed and the resultant outputs shown
- can show any combo of input values