Electromania Lecture

Electronics Club

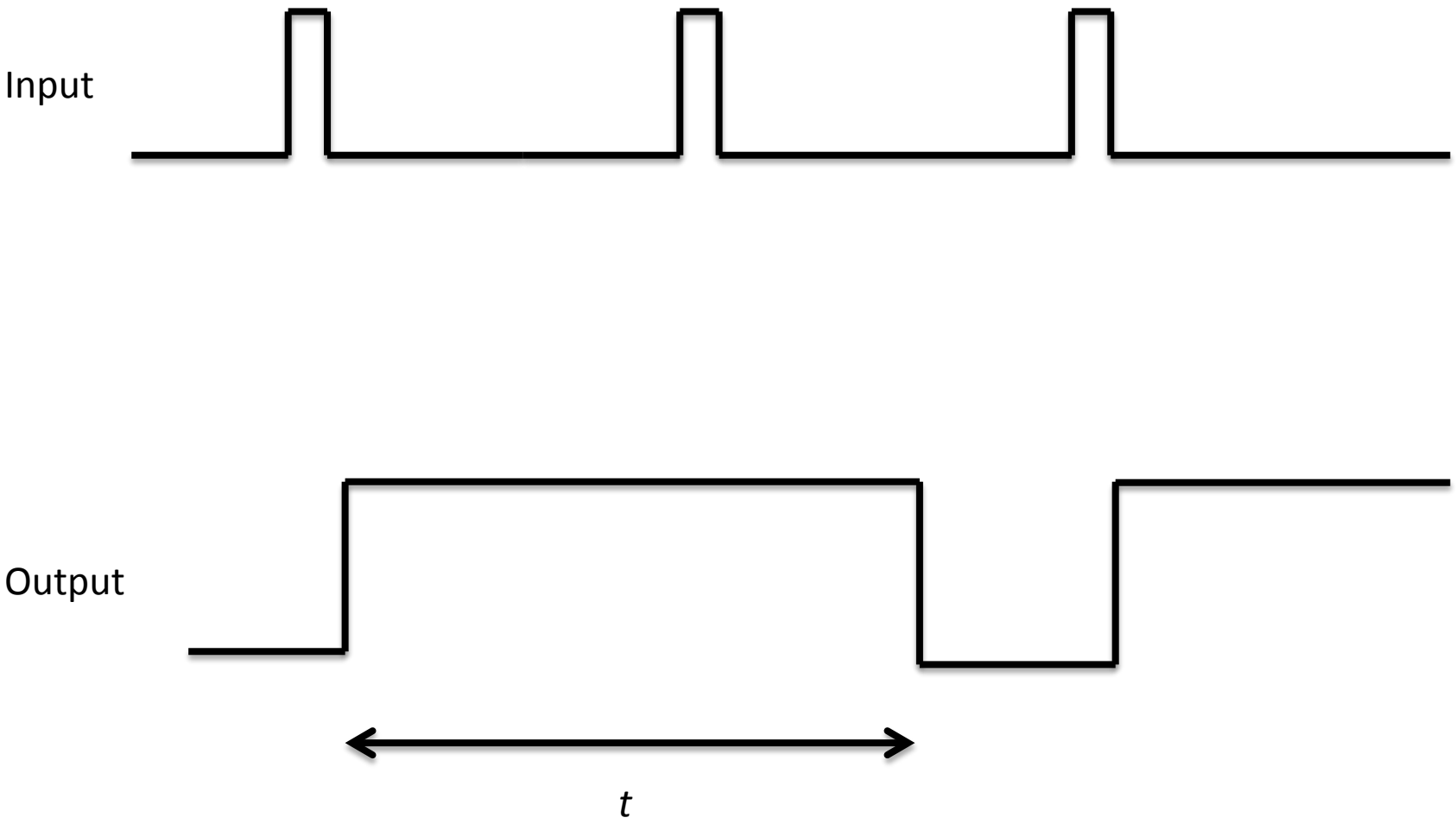
Electronics
IIT Kanpur Club

Stuff you already know

- 555
- 4029
- 7447
- Binary operations (AND, OR, NOT, etc.)
- Multiplexers and Demultiplexers

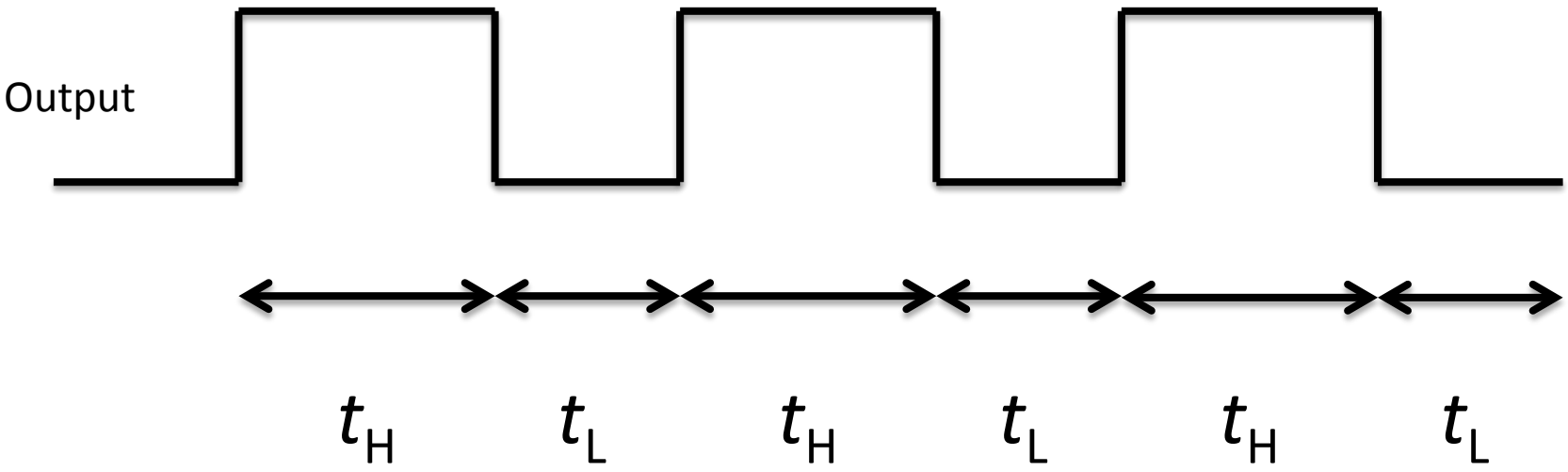
555 (Monostable Timer)

- While output is LOW, it waits for a falling edge (transition from HIGH to LOW) in input and then sets output to HIGH for time *t*
- While output is HIGH, it ignores input


Input
Output
t

555 (Astable mode)

- No input, only output
- Output is a rectangular wave
- HIGH time and LOW time is user defined


Output
t_H
t_L
t_H
t_L
t_H
t_L

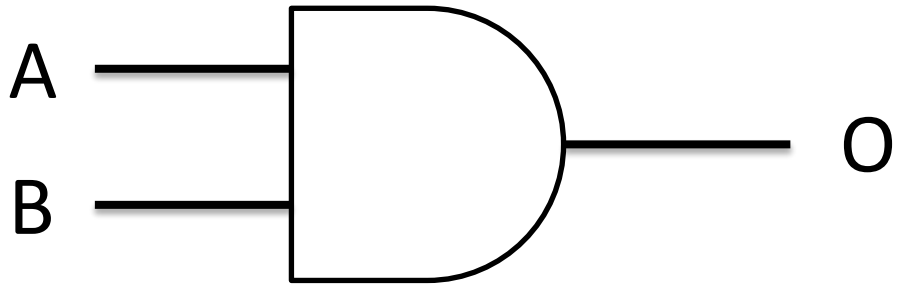
4029 (Counter)

- Has one input pin, 4 output pins
- Output is always a binary number *x*
- When a rising edge (transition from LOW to HIGH) is detected on the input pin (CLK), output is incremented by 1 to (*x +1*)
- After reaching maximum value, on detecting a rising edge on input, output reverts to 0

7447 (BCD Decoder)

- Receives 4-bit binary number as input
- Output directly connected to BCD display

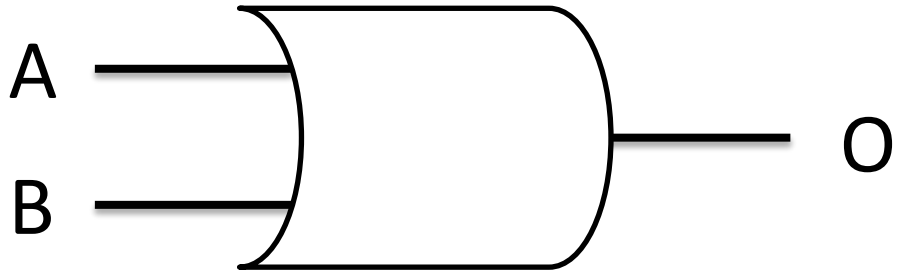
AND (4081)



A	B	O
0	0	0
0	1	0
1	0	0
1	1	1

$$O = A.B$$

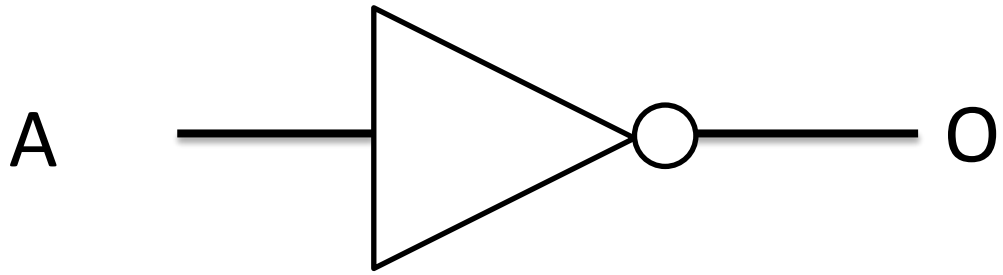
OR (4071)



A	B	O
0	0	0
0	1	1
1	0	1
1	1	1

$$O = A+B$$

NOT (4069)



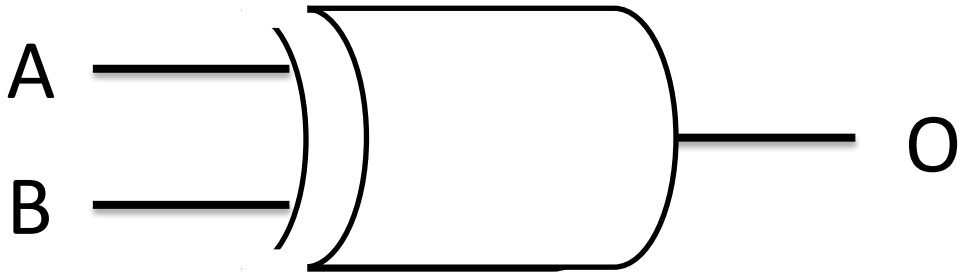
A	O
0	1
1	0

$$O = \overline{A}$$

Others…

- NAND – NOT of AND
- NOR – NOT of OR

XOR (4070)



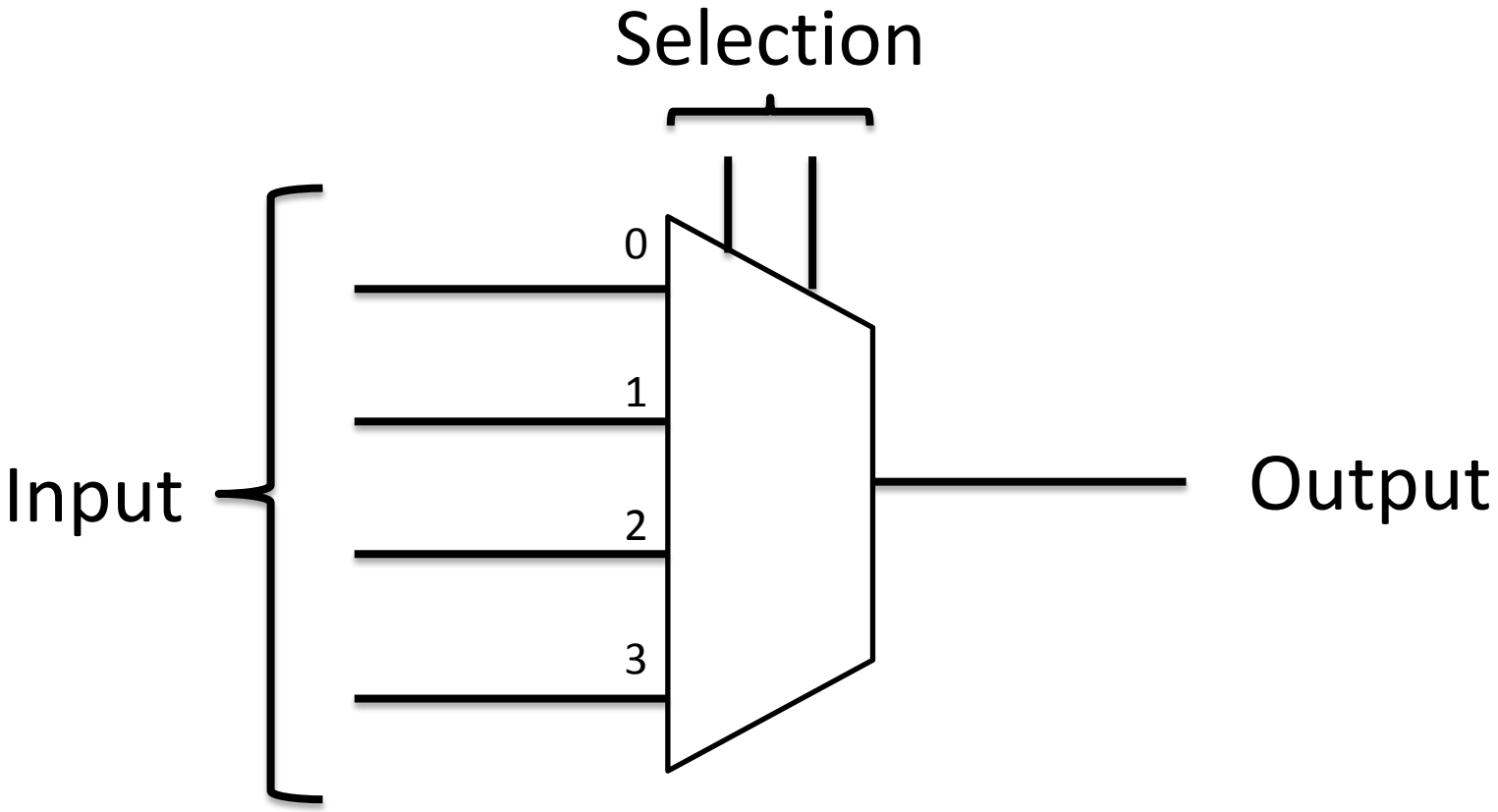
A	B	O
0	0	0
0	1	1
1	0	1
1	1	0

$$O = A \hat{} B$$

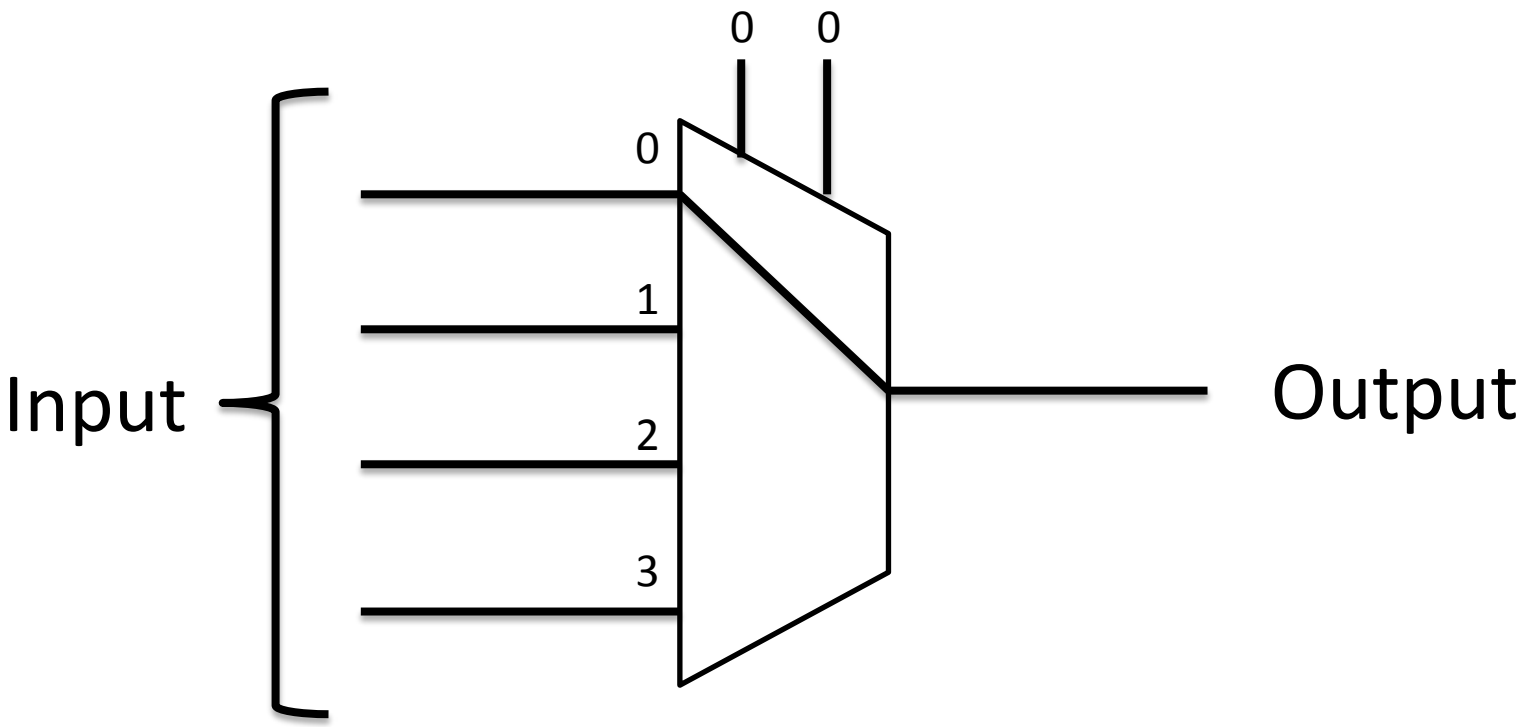
Multiplexer

- Multiple input, one output
- A single input line is connected electrically to the output
- The selection of the input line is done via separate input

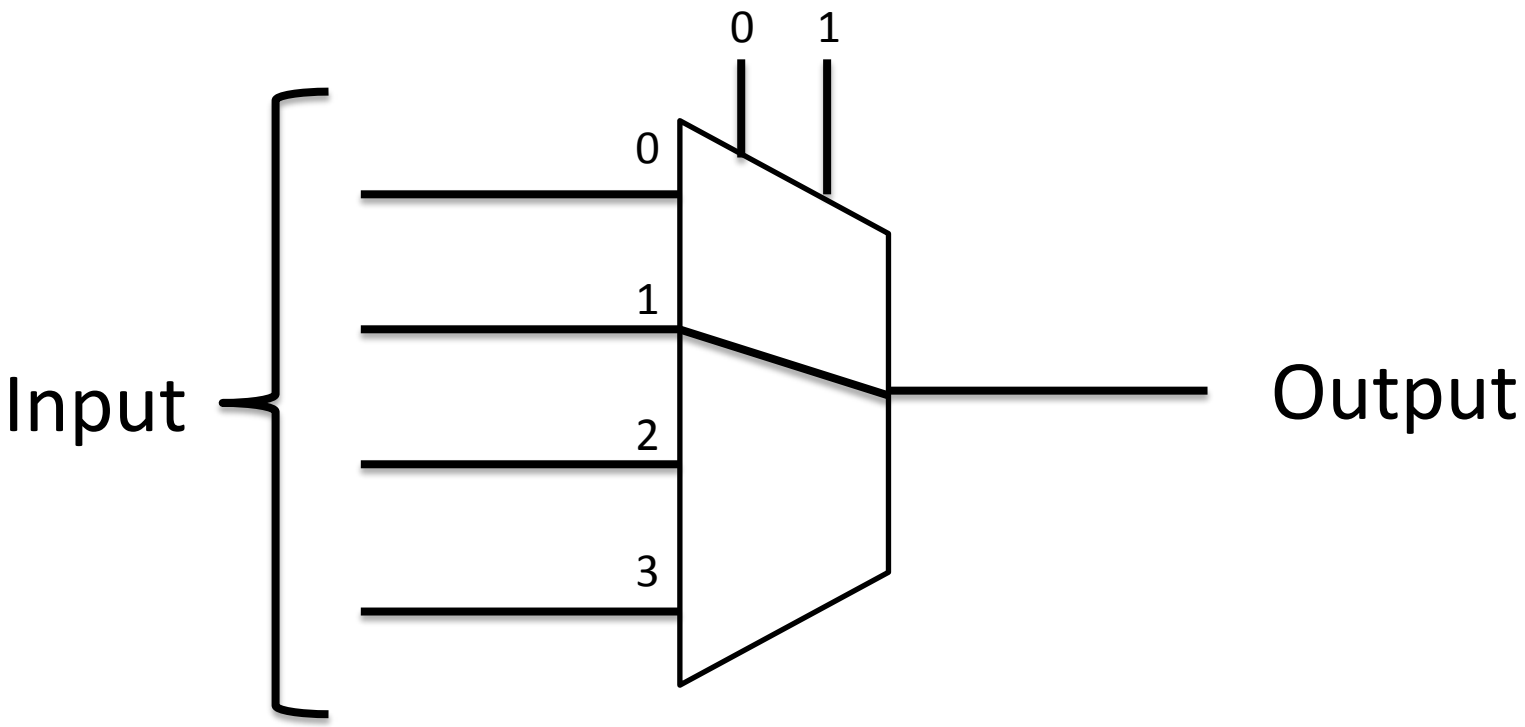
Multiplexer



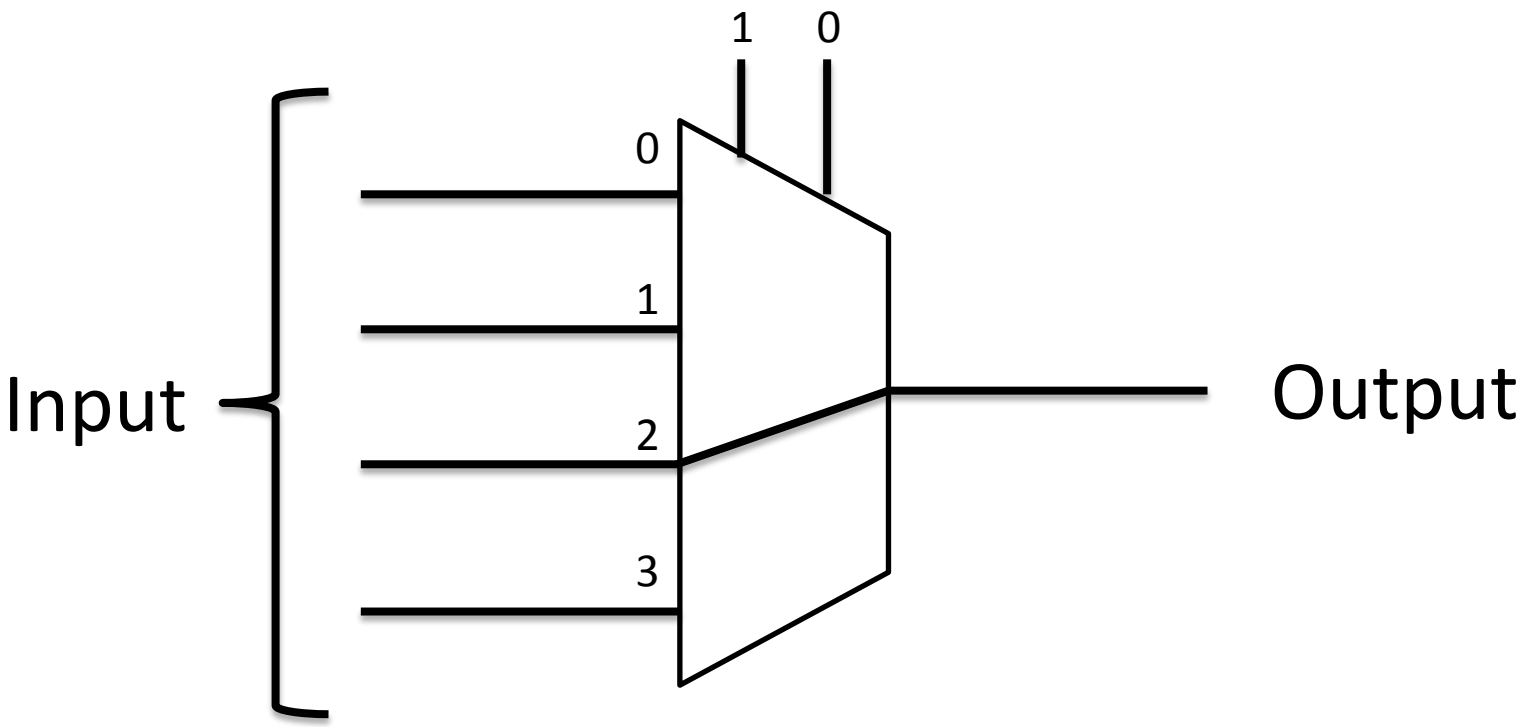
Multiplexer



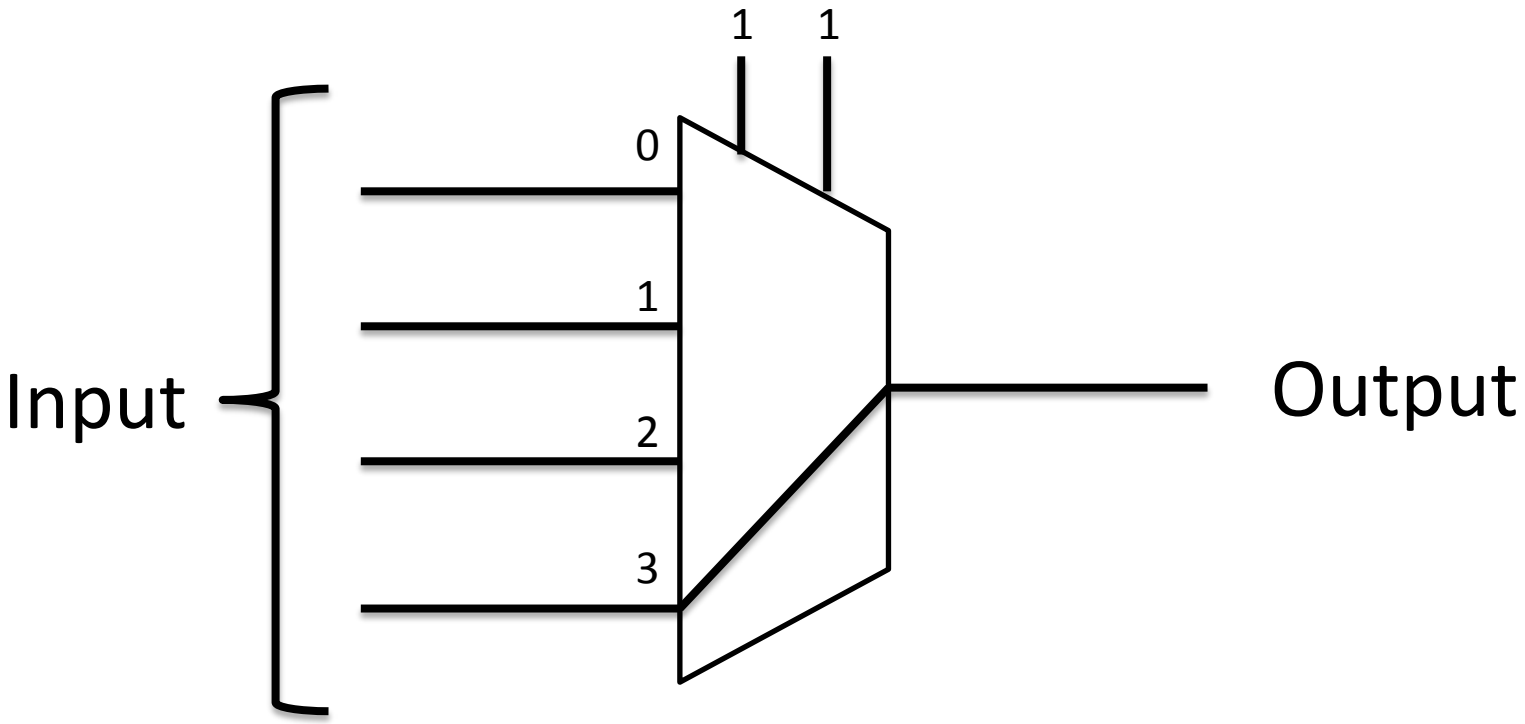
Multiplexer



Multiplexer



Multiplexer



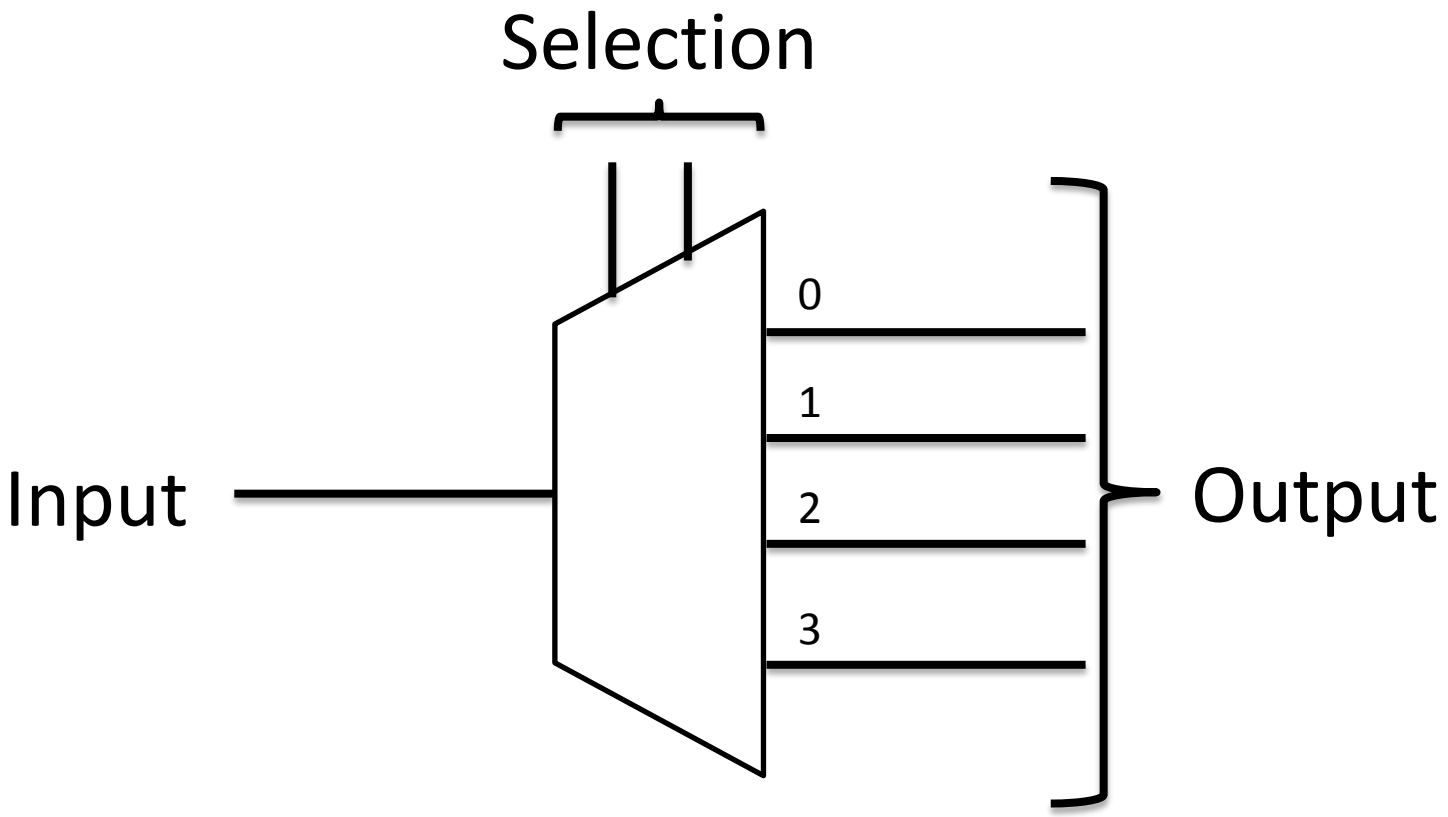
What do we mean by “Electrical”?

- Connection is analog, not digital
- Any value of voltage is copied to output, and any input current is transmitted to the output
- It is as if the input and output have been shorted by a wire

Demultiplexer

- Opposite of multiplexing
- Multiple output, single input
- Input is electrically connected to one of the output lines
- Selection of output line is done via separate input

Demultiplexer



What's the difference?

- Since the connection is electrical, same IC can act as multiplexer as well as demultiplexer
- We call this Mux-Demux
- In particular, the above IC is 4052 – a 4 X 1 Mux-Demux

Dual Master/Slave JK Flip Flops

FLIP FLOPS

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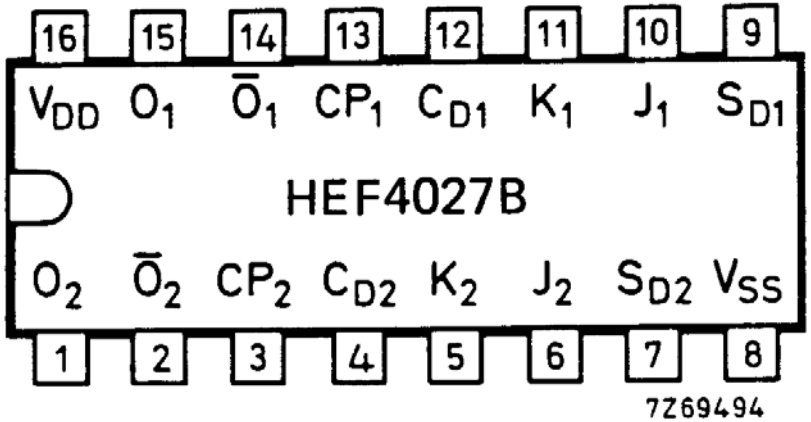
Flip-Flops (4027)

- Can be used as toggle switches
- One clock input, one output
- On receiving pulse on input, output “toggles”

Pin Diagram and Truth Table



Inputs					Outputs	
S_d	C_d	CP	J	K	O_{n+1}	$\overline{O}_{n+1}$
H	L	X	X	X	H	L
L	H	X	X	X	L	H
H	H	X	X	X	H	H

Inputs					Outputs	
S_d	C_d	CP	J	K	O_{n+1}	$\overline{O}_{n+1}$
L	L	_/	L	L	O_n	$\overline{O}_n$
L	L	_/	H	L	H	L
L	L	_/	L	H	L	H
L	L	_/	H	H	$\overline{O}_n$	O_n

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Problem Statement

ELECTROMANIA

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Thank you!

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