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PRN no: 2020BTEC900051
Branch: Computer Science

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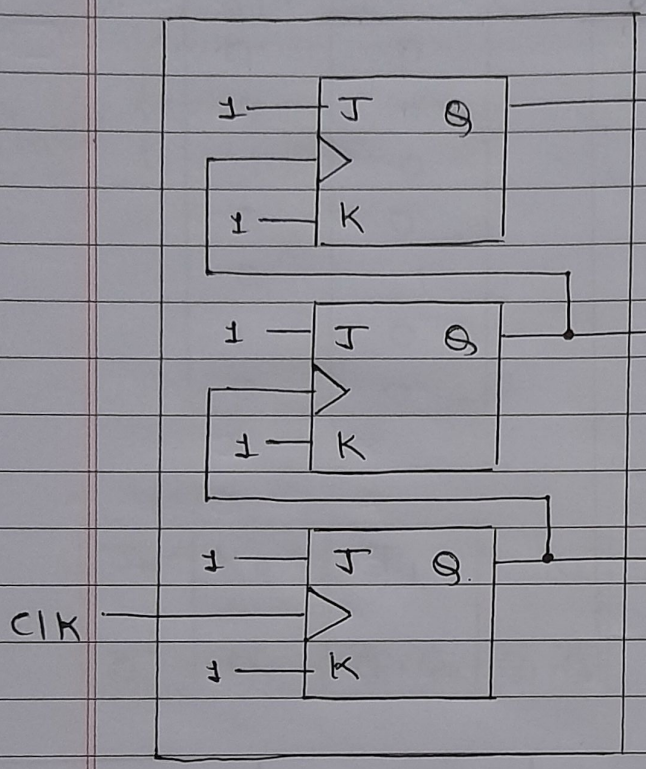
- Asynchronus counter:-
clock is given only to the least significant flipflop, in an asynchronus counter.



Q_2	Q_1	Q_0
0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0
1	1	1
0	0	0

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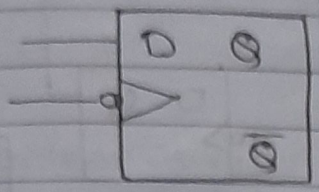
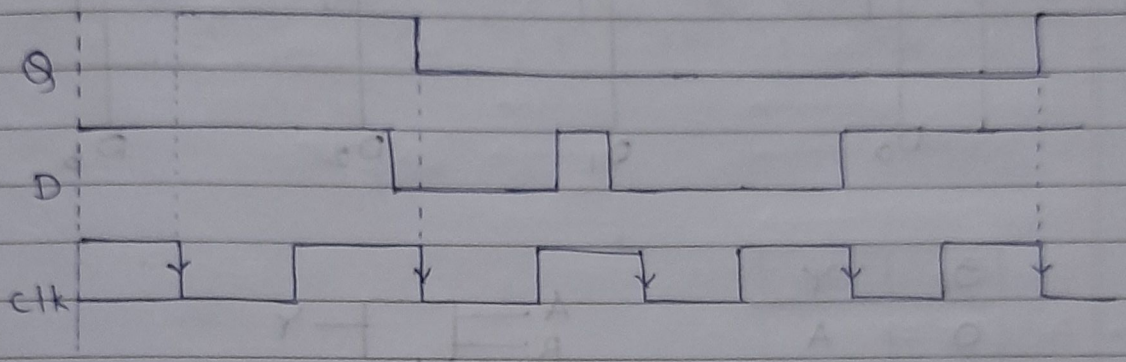
- Shift Registers :-



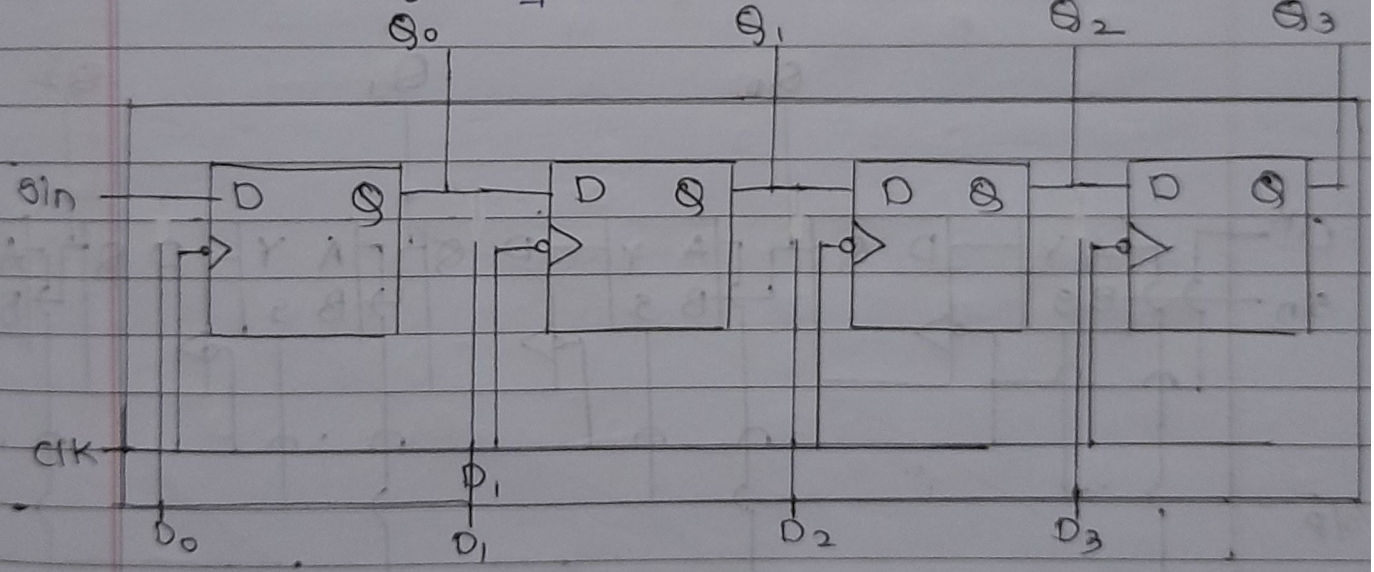
D Latch.

Truth Table :-

clk	Q
0, ↓, ↑	Last state
↓	D.



- 4 bit shift register



Sin = 0

Q3	Q2	Q1	Q0
1	0	1	1
0	1	1	0

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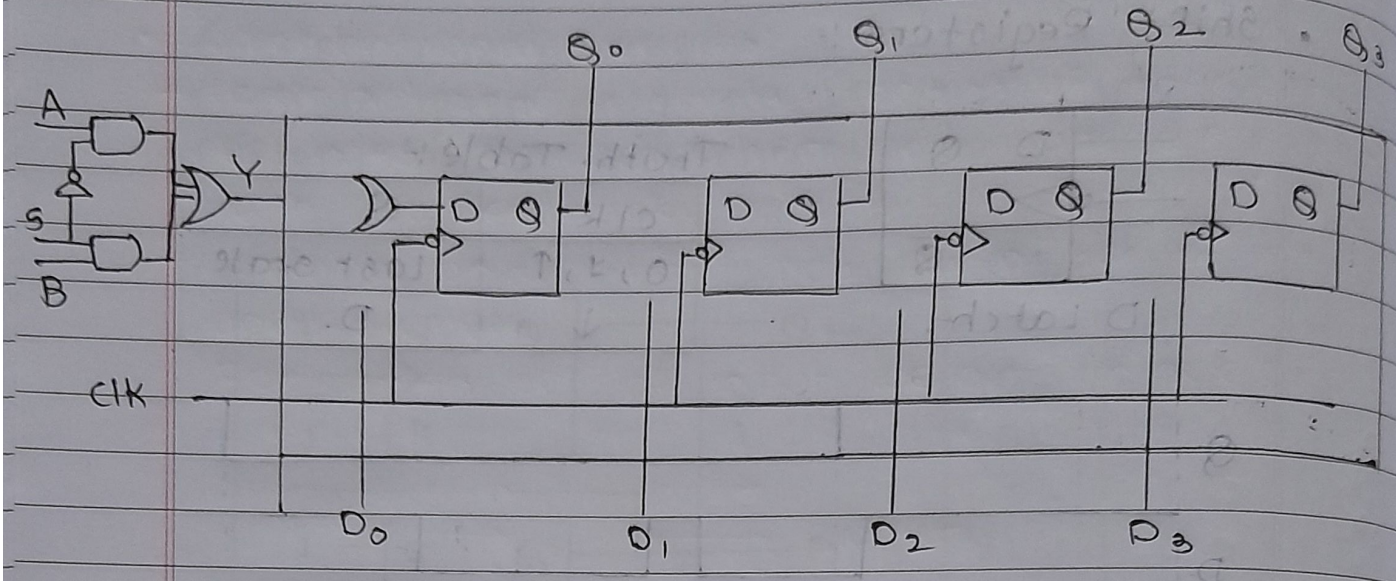
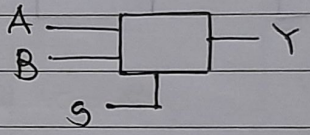
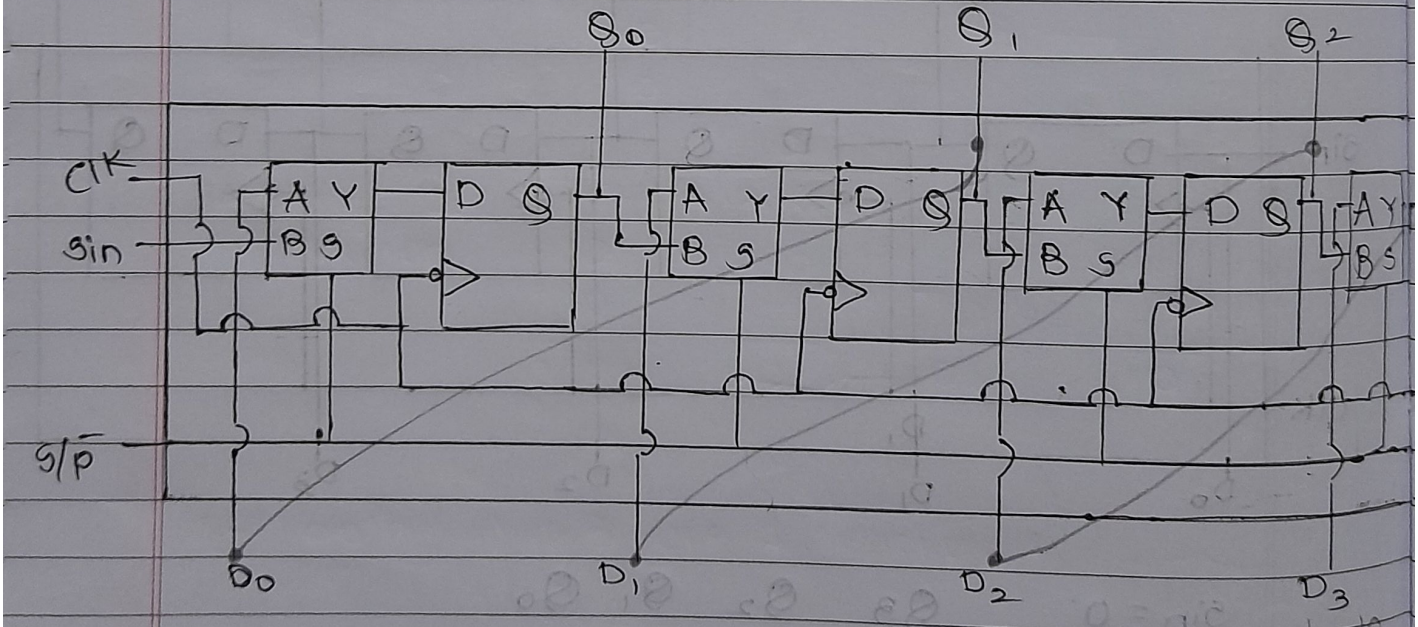


S	Y
0	A
1	B





Parallel mode ← $S/\bar{P} = 0$ D_0 D_1 D_2 D_3

Serial mode ← $S/\bar{P} = 1$ Sin Q_0 Q_1 Q_2

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e.g Q_3 Q_2 Q_1 Q_0

1 1 0 1

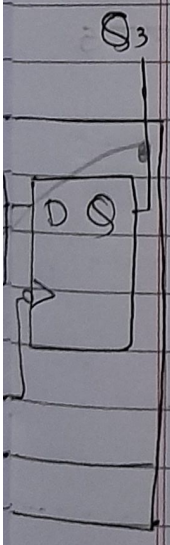
1 0 1 1

Revenge shifting ⇒

$S/\bar{P} = 0$ Q_3 Q_2 Q_1 Q_0

1 0 1 1

0 1 0 1 x



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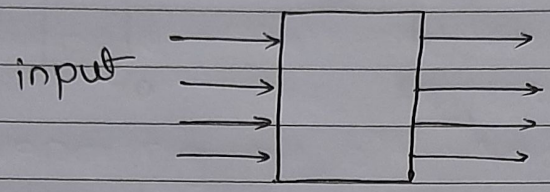
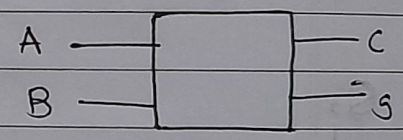
- Combinational circuits:-
  - combinational circuits consist of interconnection of gates to each other and cascading them with no feedback.
  - combinational circuit has given set of input and outputs.
  For given set of input we get unique output.



- Adder ⇒
  In Binary Arithmetic.

A	B	carry	sum
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0



Adding 2, 1 bit number
explanation:

$$\begin{array}{r} 0 \\ +\,0 \\ \hline 00 \\ \uparrow\uparrow \\ CS \end{array} \qquad \begin{array}{r} 0 \\ +\,1 \\ \hline 01 \end{array} \qquad \begin{array}{r} 1 \\ +\,0 \\ \hline 01 \end{array} \qquad \begin{array}{r} 1 \\ +\,1 \\ \hline 10 \end{array}$$

If both A & B are 1, then carry = 1

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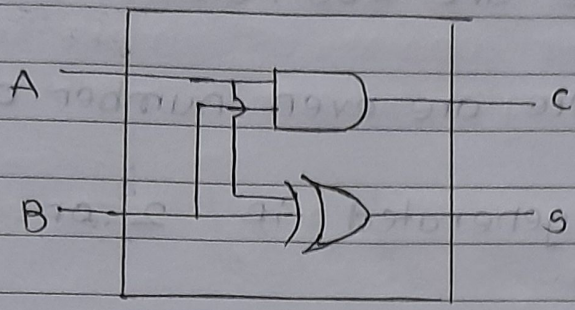


Half Adder.

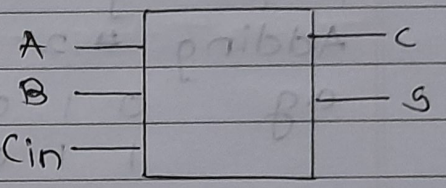
- Adding 2, 2 bits number.

e.g A_1 A_0

B_1 B_0

C_1 C_0

C_1 S_1 S_0



- Addition of 2 Bit number is 3 bit number.
- Here we need full adder.

Truth table of full adder ⇒

Cin	A	B	Cout	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

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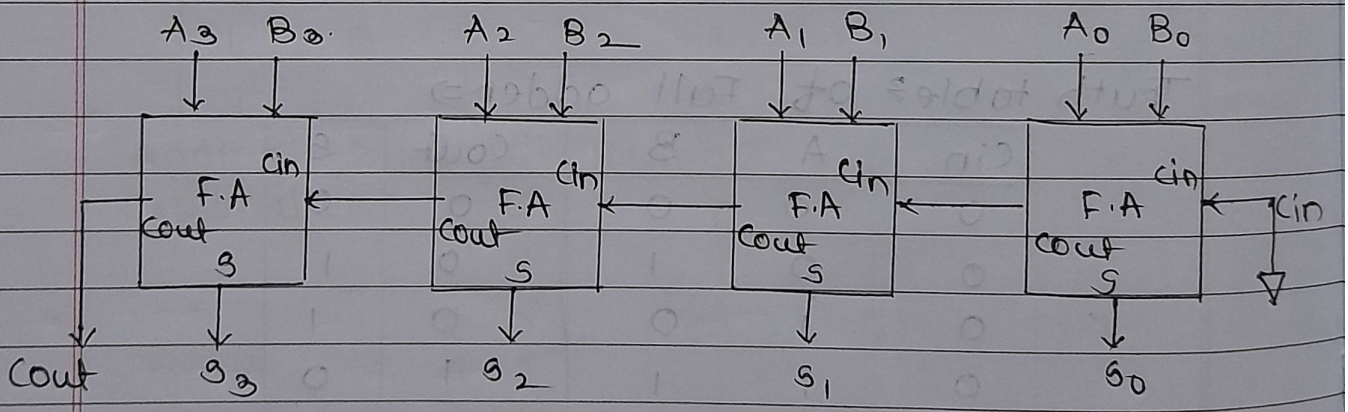
1) When there are odd number of 1's, sum is 1
2) When there are even number of 1's, sum is 0
3) carry is generated if 2 or more 1's are there.

- 2 Half Adder and 1 OR gate is used to prepare Full Adder.

- preparing 4 bit Full Adder:-
Adding 2 numbers of 4 bits.

e.g
```
    0 1 0 1   ← A
    1 1 0 1   ← B
  1 1 0 1 Cin
-------------
  1 0 0 1 0
```




```
      A3  A2  A1  A0
+     B3  B2  B1  B0
-------------------
Cout  S3  S2  S1  S0
```

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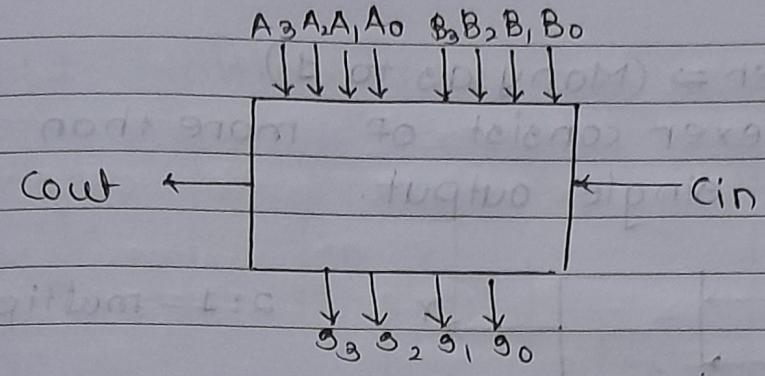
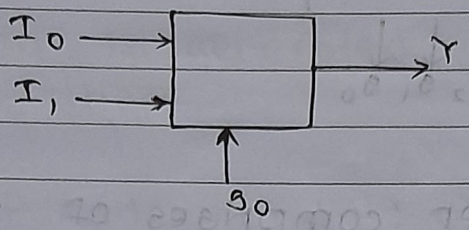


A 4 bit full Adder comprises of 1 carry in, 1 carry out, & 2 / 4 bit inputs A and B, 1 4 bit output sum.

- Multiplexer ⇒ (Many as to 1)
  - A multiplexer consist of more than 1 inputs and only single output.

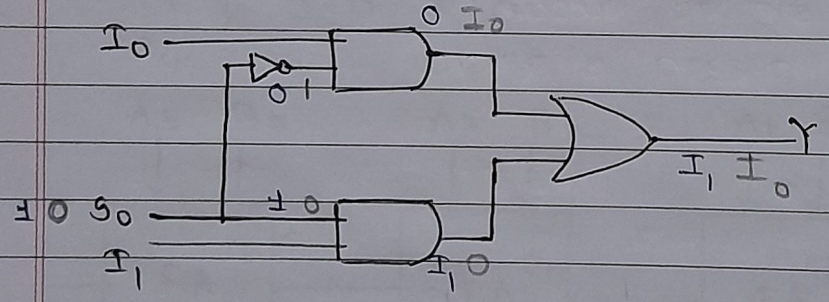


2:1 multiplexer

- S_0 is select line that decides which input should come on the output

Truth Table :-

S_0	Y
0	I_0
1	I_1



- For 2^n : 1 multiplexer,
  input line ⇒ 2^n
  output line ⇒ 1
  select line ⇒ n.

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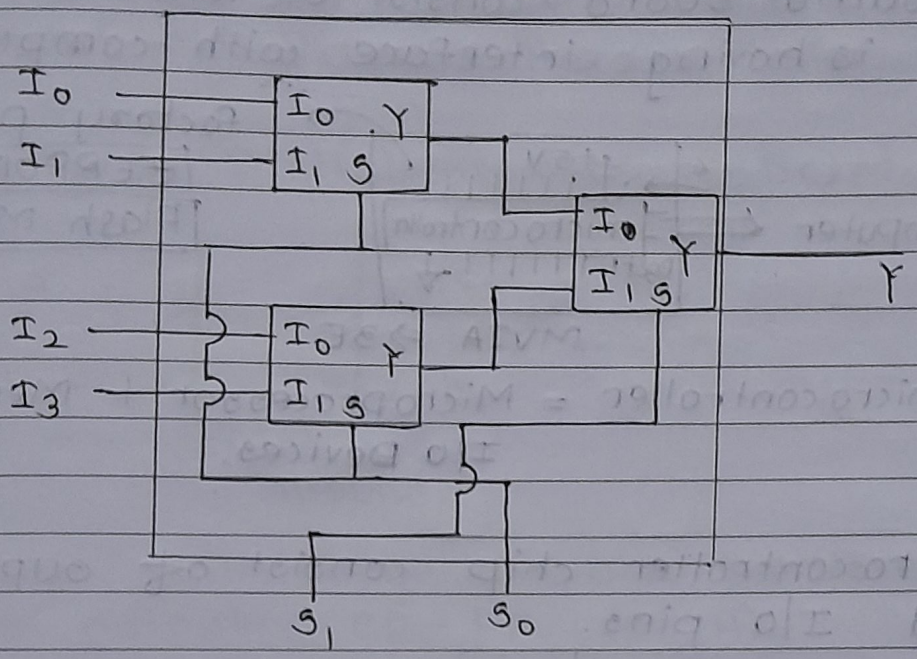
- 4 : 1 Multiplexer ⇒



1) $S_1 = 0$, Top multiplexer o/p appears on final o/p.
2) $S_1 = 1$, Bottom multiplexer o/p appears on final o/p.

Truth table :-

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

S_0 decides which output should appear on 1st layer multiplexer.
S_1 decides Final o/p.

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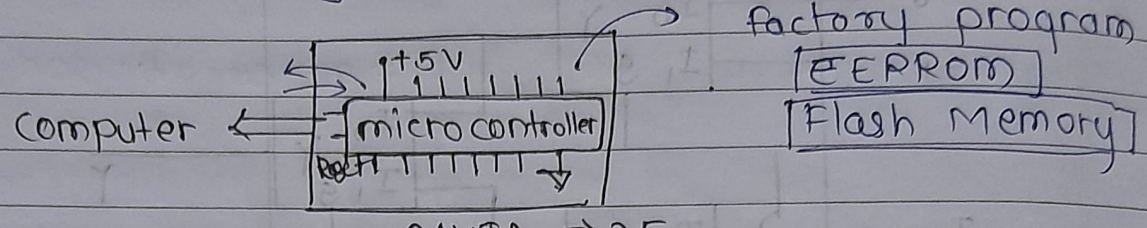
- Arduino Board ⇒

- Arduino Board consist of micro controller chip, it is having interface with computer.



MVIA ⇒ 3E

micro controller = Microproceggor + Memory + I/O Devices.

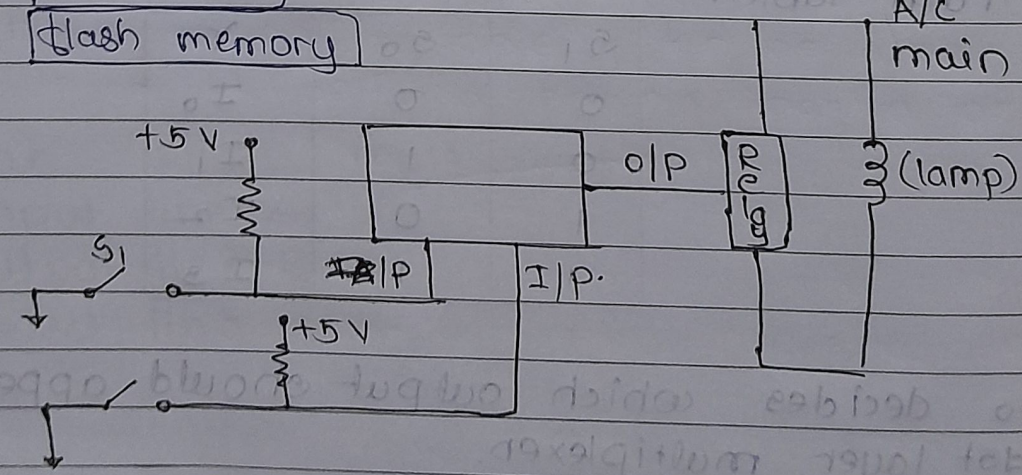
- Micro controller chip consist of supply pins and I/O pins.

- Power on Reset circuit ⇒ Resets the circuit. and Micro ~~processor~~ starts program from Address 0, which is present in memory.

factory Programmed.

EERROM

flash memory



$y = S_1 \oplus S_2$

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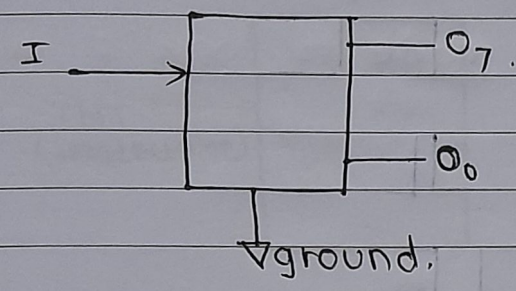
- Arduino Board Pins ⇒
- Digital I/P pin → user controller & microcontrol Read
- Digital O/P Pin → Mirocontroller controls it.

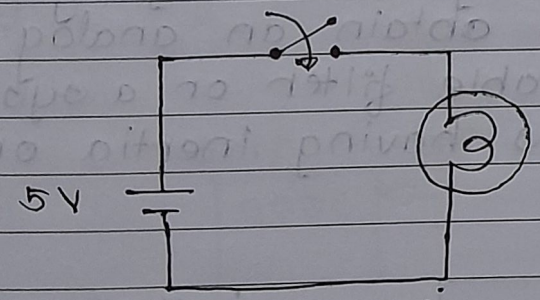
- Analog to Digital converter (ADC) ⇒



Input into Range of 0 to 5 V is converted into output 00 - FF. (80 H).

$\frac{5}{255}$ ⇒ 1 UNIT.

- Analog o/p pin is not available, but output is generated in another Form i.e pulse width modulated form (PWM).



- To change intensity of lamp with no resistor and constant voltage supply. If ON/OFF takes place at rapid rate, then filament willbe heated at average rate.

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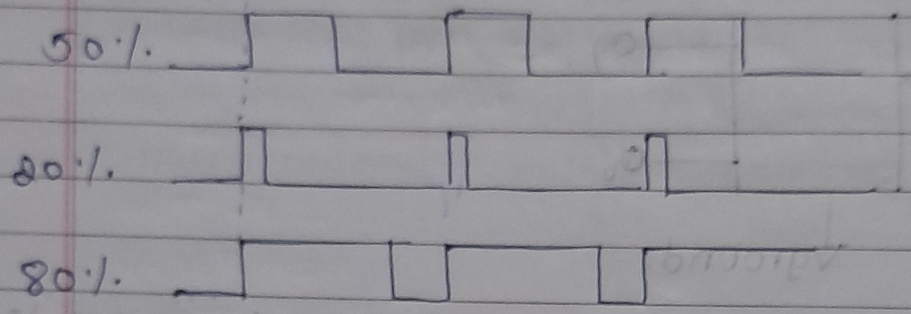
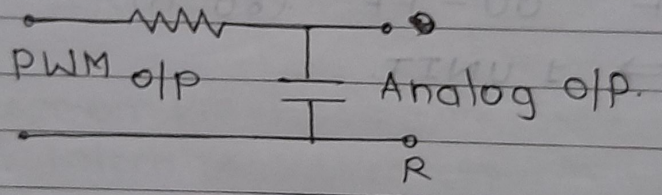
- This is called pulse width modulation o/p generates a square wave where Duty cycle can be from 0% to 100%.

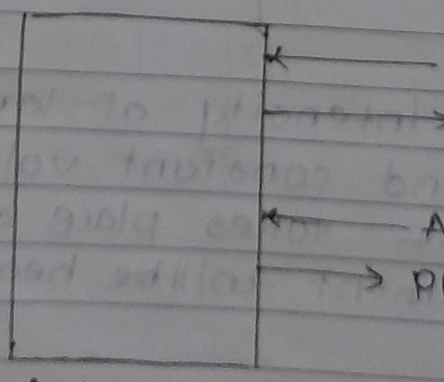
square wave ⇒





pin

- PWM output is a digital output pin in which by controlling it's duty cycle it is possible to ~~out~~ obtain an analog output by putting suitable filter or a system which it self is having inertia or heater



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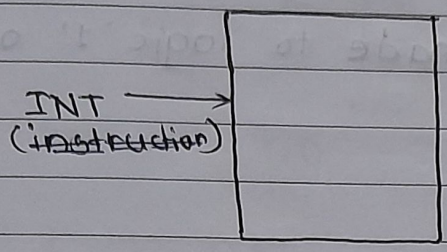
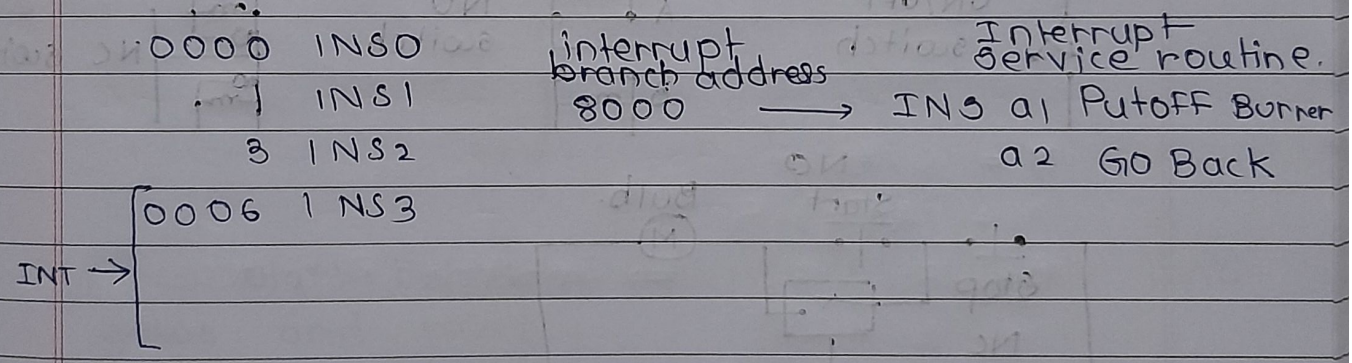
- Interrupt Inputs ⇒.
- A program on arduino board consist of sequence of instruction, which are executed sequencially and then goes back to starting step.

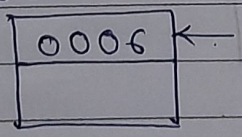


PC - 0000 INSTIC

- Interrupt is an input pin which is checked after instruction, automatically.
- It doesn't consume anytime.



Scratch PAD



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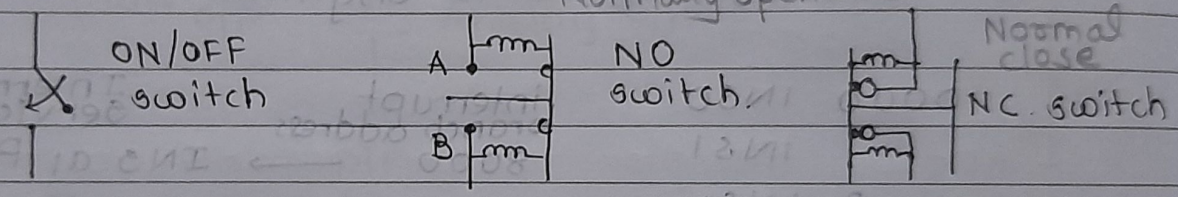
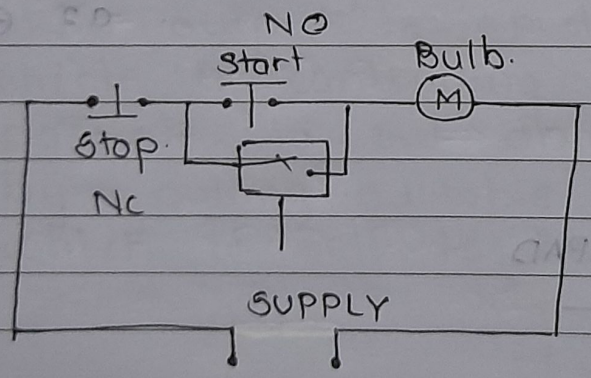
- Arduino Programming

General purpose Digital I/O pins.
I/p pin → switch ← → Manual switch.
O/p pin → Read P0.0
Input P 1.1.

output pin will be made to logic '1' or logic '0' by microcontroller.

SET P1.2
RESET P2.1
WRITE (P1.3, FLAG)
OUTPUT (P 3.2, 0)





1) Press START
⇓
MOTOR START. and continues to run even if the start button is released.

2) Press STOP
Motor stops and even if you release stop button, motor doesn't stop.

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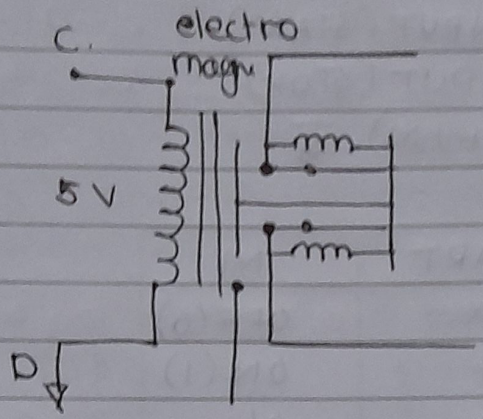

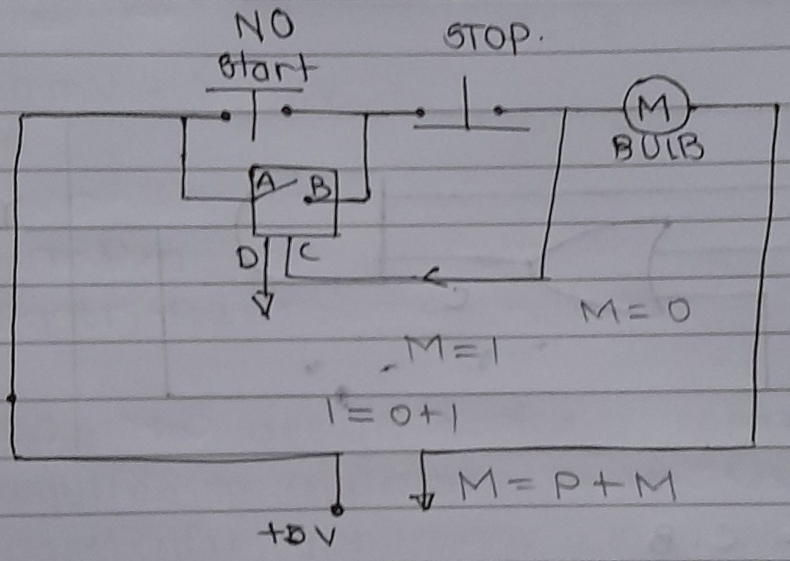

When start button is pushed, motor starts, bulb glows and relay
Using start button, ~~bulb~~ motor can be started and using stop button motor can be stoped

READ START
READ STOP
$M = (P+M).\overline{S}$

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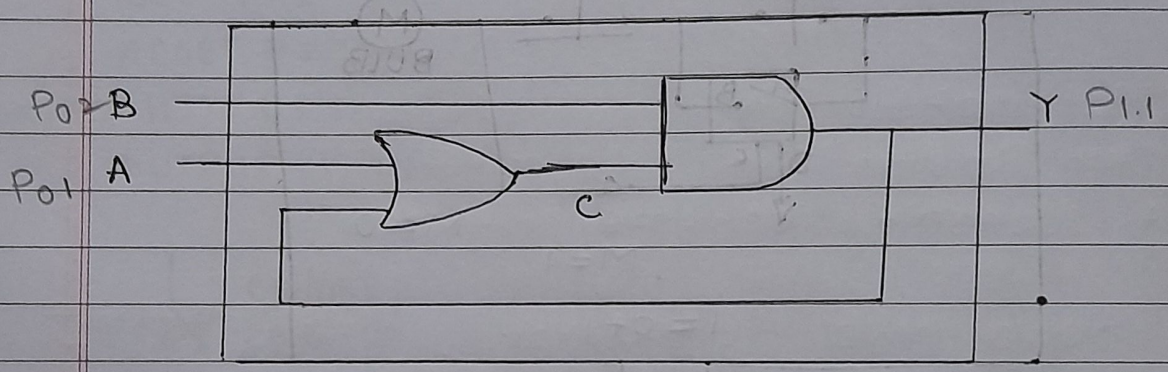
label P = INPUT (START)
Q = INPUT (STOP)
M = (P+M). $\overline{Q}$:

STOP	START	M
1	X	OFF (0)
0	1	ON (1)
0	0	0/1



Y = C . B
Y = (A+Y) . B
B_0, B_1, B_2 ⇒ internal Registers.
A B Y

```
B0 = READ P0.1          AND B0, B1
BEGIN: MOV B0, P0.1     MOV P1.1, B2
       MOV B1, P0.2     JMP BEGIN
       OR B0, B2
```

Microcontroller instructions are either arithmetic logic instruction or input/output ~~operati~~ instruction.

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- Analog I/P , PWM O/P

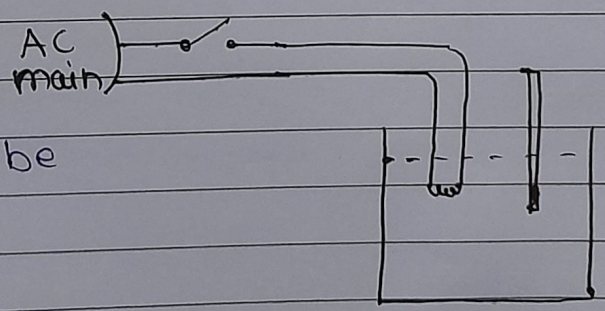
Analog I/P is there are in built analog to digital converters and it is possible to read that pin.

	8 Bits	Analog.
5V ⟶ 2550	P2.0	00
5I ⟶ 255	P2.1	.
	P2.3	.
5000 mV / 250 = 20 mV	:	:
	P2.7	FF

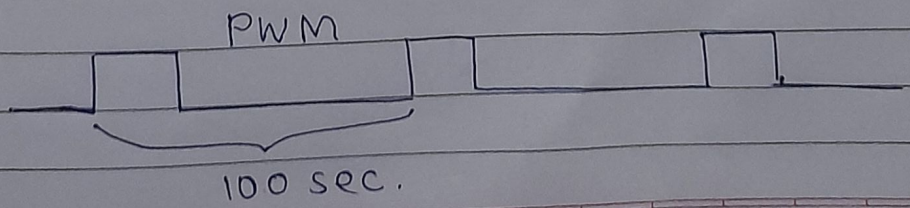
```
INPUT P2.0
MOV (R1, P20)
```

- Suppose to design a temp controller system. It requires to maintain some fixed temp for particular application. e.g water heating

Maintain fixed temp. which should be presettable.



8 switches
00 – FF



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(S.P)

User gets Setpoint ⟶ Read by Arduino

System changes Process (P.V) ⟶ Read by Arduino.
Variable

SWITCH

O/P Pin ⟸ Controlled by Arduino.
(READ)