Lab report:5

Name:-Harshit Goyal	Group:-6	Roll number:-2023102054	Table no:12

PART-A

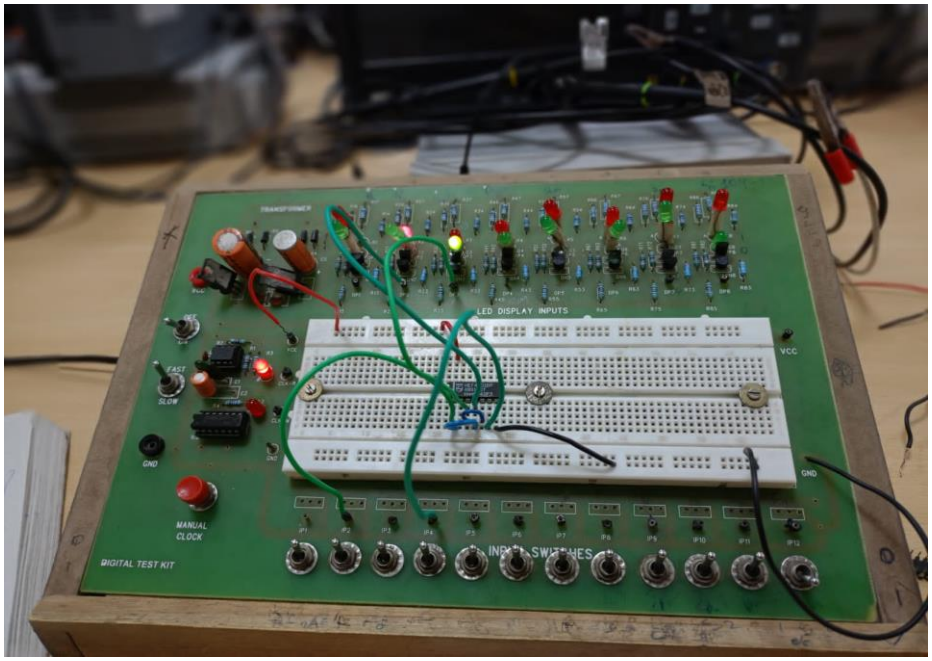
OBJECTIVE:-

To make a SR latch for asynchronous circuits using NOR gates.

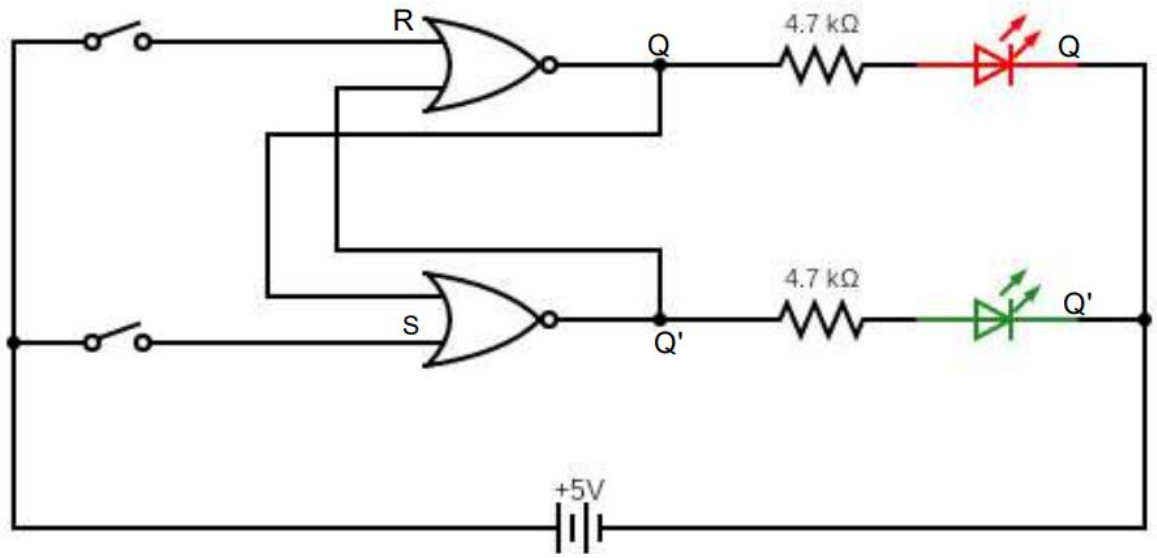
ELECTRONICS COMPONENTS USED:-

- Coloured wires,
- CD40001(NOR) IC.
- Coloured LEDs,
- Breadboard,
- Power supply;
- Resistors.

Lab reference circuit:-



Reference circuit:-



Procedure:-

- Connect the ICs to the breadboard's VCC and GND as well as the power supply for the digital test kit.
- Verify that the IC is properly functioning.
- Connect the wires in the reference circuit's indicated locations.
- Enter data in the format requested by the switches.
- Examine the output values and tabulate its values.

Question: S R = 01, 00, 10, 00, 01, 10, 01, 00, 11, 00, 10, 11, 00, 01, 11, 00. When given the above inputs, explain till when the latch can be expected to operate correctly and why?

Answer: The latch works fine until 11 is entered as input. When 11 is entered both outputs go to 0 whereas they should always be complements of each other. After entering 00 now the latch is in an unpredictable condition and any one of the outputs can go to 1.

Conclusion:-

The SR latch gives output according to the following table:

S	R	OUTPUT(Q_{t+1})
0	0	Q_t
0	1	0
1	0	1
1	1	Forbidden

Since when 11 is given as input output leads to both Q and Q' being 0 contradicting the fact that both should be opposite, it is forbidden.
Sequence of outputs for inputs given in lab manual:

01	00	10	00	01	10	01	00	11	00	10	11	00	01	11	00
0	0	1	1	0	1	0	0	00	0	1	00	0	0	0	0

In the above table 0 implies Q' is on and 1 implies Q is on. When 11 is given 00 implies both are off. After 11 when 00 is given the output can be 0 or 1 depending on the physical conditions of the circuit. In this case it ends up as 0. This is not deterministic.

TinkerCAD Link:-

https://www.tinkercad.com/things/lq7Qe0eJnqa-lab5parta/editel?sharecode=DyKVjo31OpfS5Q-VQ-ze6LbQLHHkCxl9u2Cem_Q2AS4

PART-B

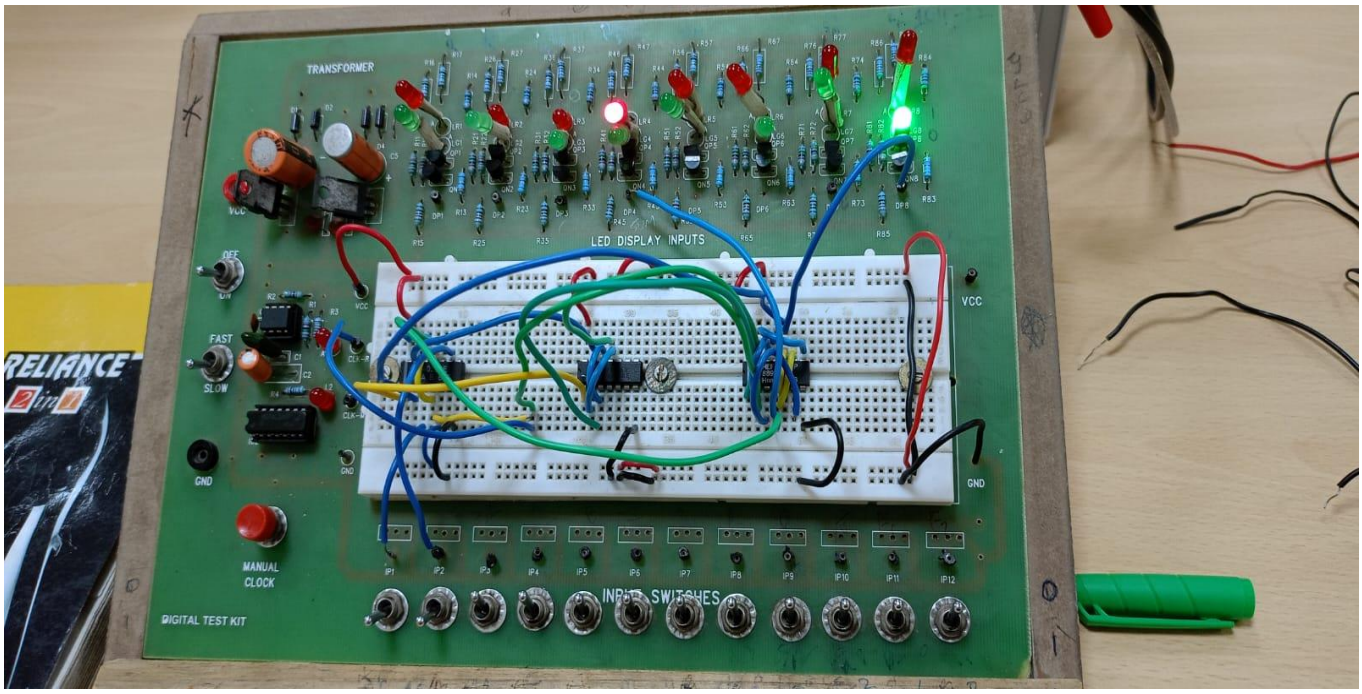
OBJECTIVE:-

To make a JK flip-flop for synchronous circuits with master slave configuration.

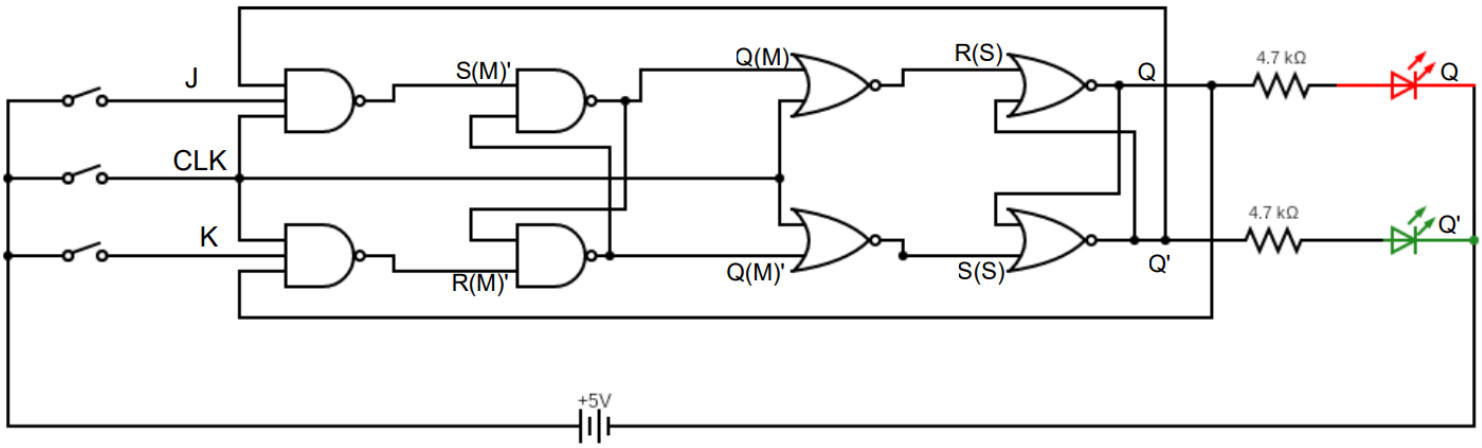
ELECTRONICS COMPONENTS USED:-

- Coloured wires,
- CD4001(NOR),
- 74HC00(NAND),
- Coloured LEDs,
- Resistors,
- Breadboard,
- Power supply
- CD4012(4 INPUT NAND) ICs.

Lab reference circuit:-



Reference circuit:-



Procedure:-

- Connect the ICs to the breadboard's VCC and GND as well as the power supply for the digital test kit.
- Verify that the IC is flawlessly functioning.
- Connect the wires in the reference circuit as displayed.
- Enter data in the format requested by the switches.
- Examine the output's worth and tabulate its values.

Conclusion:-

The JK flip flop works according to the following table:

J	K	Q_{t+1}
0	0	Q_t
0	1	0
1	0	1
1	1	Q_t'

Outputs for inputs in lab manual:

10	00	01	10	01	00	11	00	10	11	00	01	11	00
1	1	0	1	0	0	T	1	1	T	0	0	T	1

Here 0 means Q' is on and 1 means Q is on. T means it toggles between 0 and 1. After entering 11 and 00 simultaneously the final output is set according to the last state of circuit. Clearly, when 11 was entered and Q was on, as soon as 00 is entered output is 1.

TinkerCAD Link:-

https://www.tinkercad.com/things/h7vSezwUCIG-lab5partb/editel?sharecode=RQS2CDEDRqgCZwneGo9nsNwMz-2qahtH7uiqACqdd58

PART-C

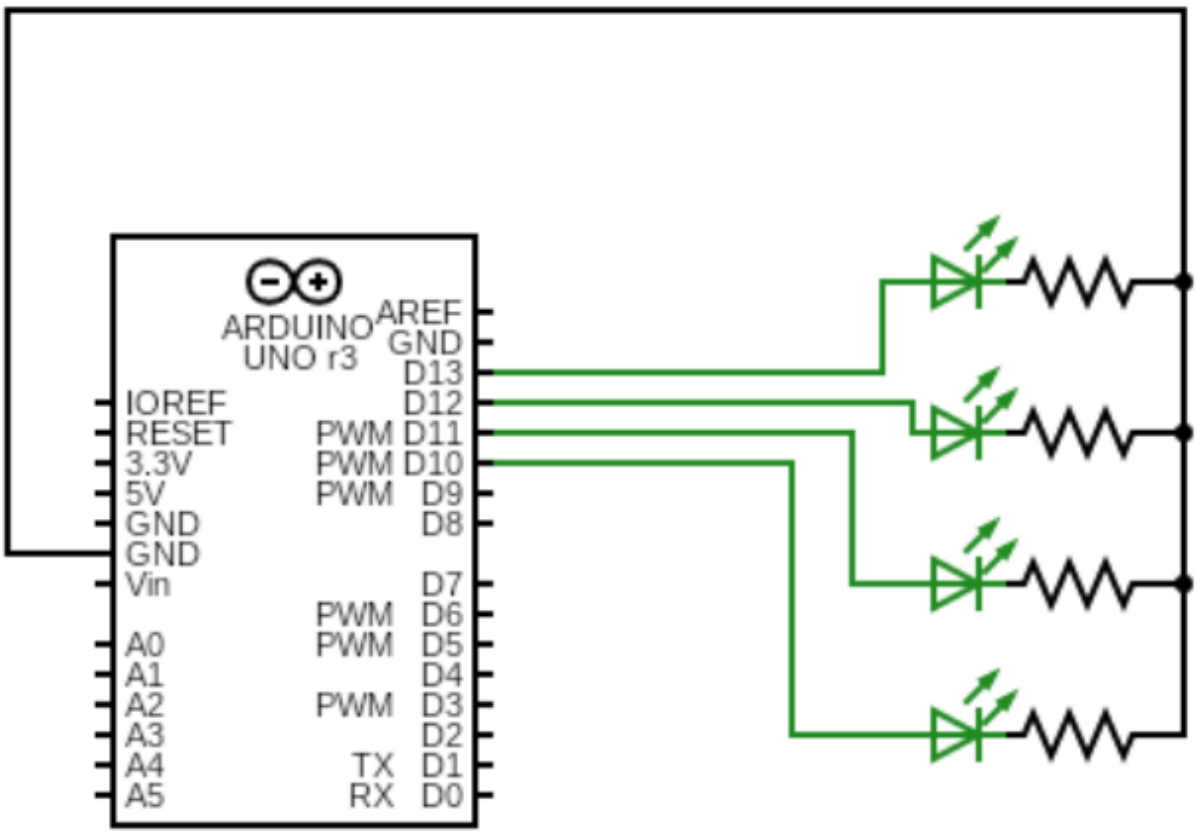
OBJECTIVE:-

To make a binary up-down ripple counter.

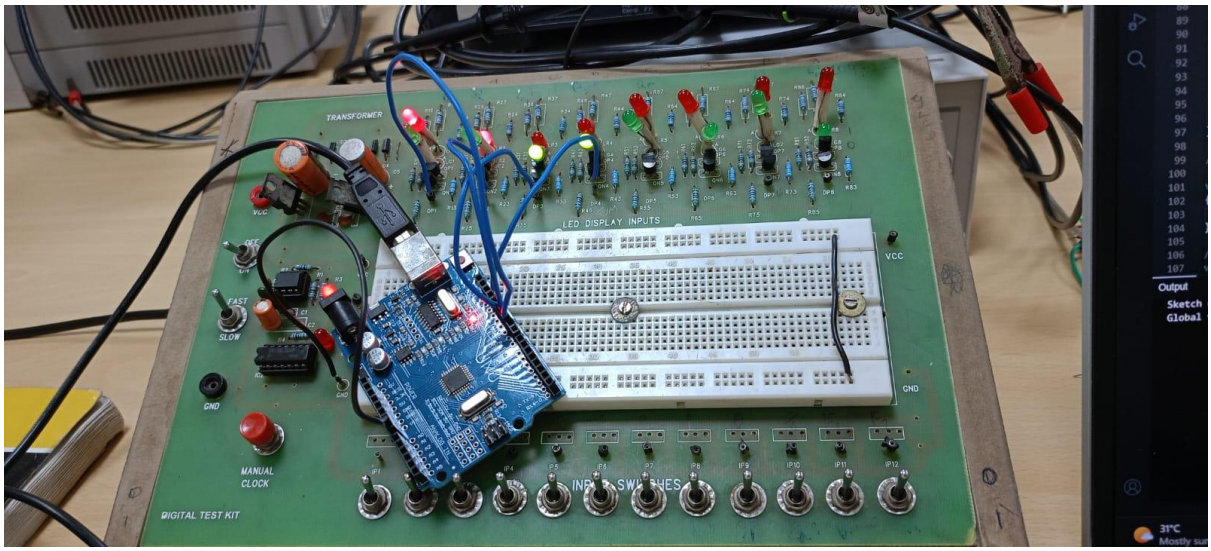
ELECTRONICS COMPONENTS USED:-

- Arduino Uno3,
- Breadboards,
- Coloured LEDs,
- Coloured wires,
- Resistors.

Reference circuit:-



Lab Reference circuit:-



Procedure:-

• Connect the 5V power and Ground wires from the Arduino to appropriate pins on the Breadboard.

• Connect pins 13, 12, 11, 10 to LEDs in turn connected to resistors and name them as t8, t4, t2, t0.

• Write the appropriate code for the inputs.

Conclusion:-

The binary up-down ripple counter counts up and down in a time of 4 seconds and repeats the same again.

TinkerCAD Link:-

https://www.tinkercad.com/things/7Pmpd4UQu7s-lab5partc/editel?sharecode=e2M6b7w51vJG1_9aP8g-ukpkivSyHPHpl4WXKXR5pwY