Lab Report 6

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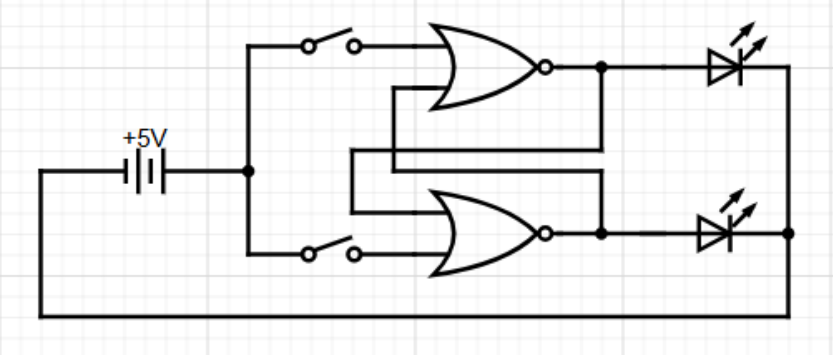
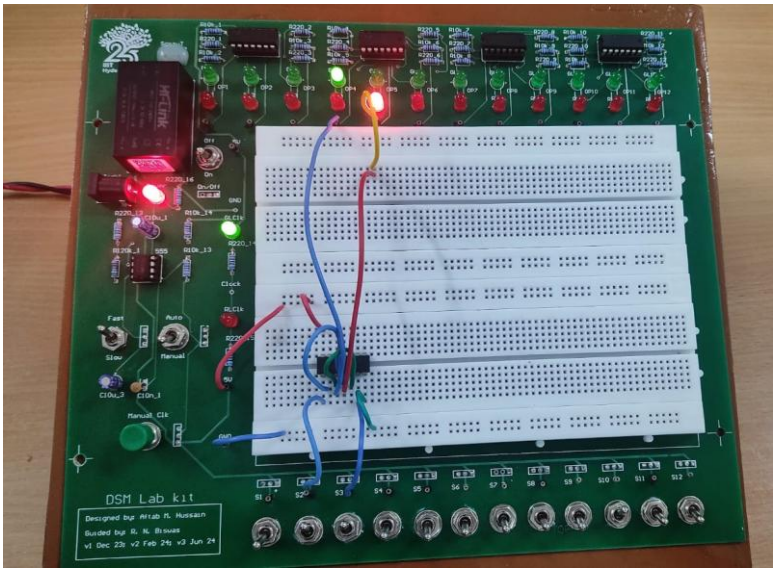
Experiment 1:-

- Objective:

  To create a S-R Latch using NOR gates and observe its function.

- Electronic Components Required:
  - 7402 2-input NOR gate IC
  - Digital Test Kit
- Reference Circuit:-





- Procedure:-
    1. Ensure that the input pins IP1-12 and output LEDs LG1-12 and LR1-12 are working.
    2. Using a 2-input NOR gate IC, assemble an SR latch as shown in the circuit diagram.
    3. Apply all possible inputs of R and S to the latch and observe the outputs in each case.
    4. Tabulate the observations and verify the function of the S-R latch.
- Observation:-

    Function table of the circuit,

S	**R**	**Q(t+1)**
0	0	Q(t) (Memory state)
0	1	0 (Reset)
1	0	1 (Set)
1	1	Forbidden

- Conclusion:-

    An S-R latch using NOR gates has been assembled and its function has been observed.
- TinkerCAD Simulation:-

    https://www.tinkercad.com/things/5X1xLI4e2QS-dsm-lab-6-exp-1?sharecode=LkADH9MJCZeNb_d3srh3YiamyXwN9jUDJuAE9Fspz9Q

Experiment 2:-

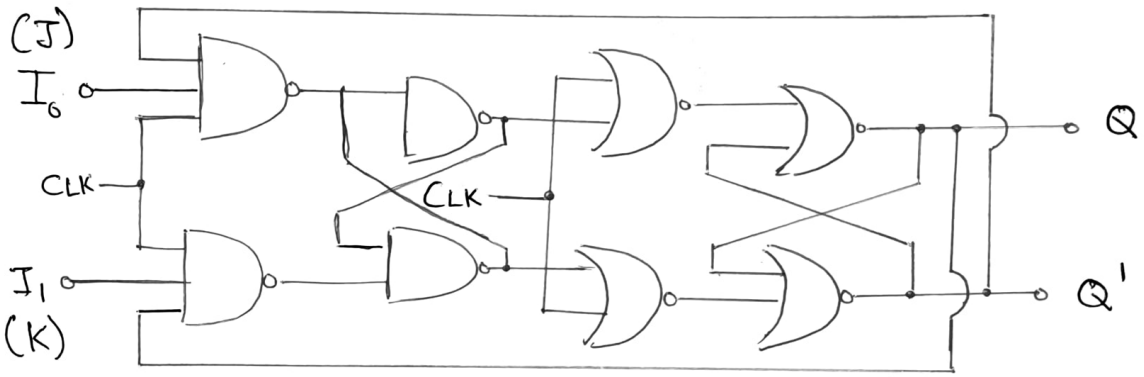
- ## Objective:-

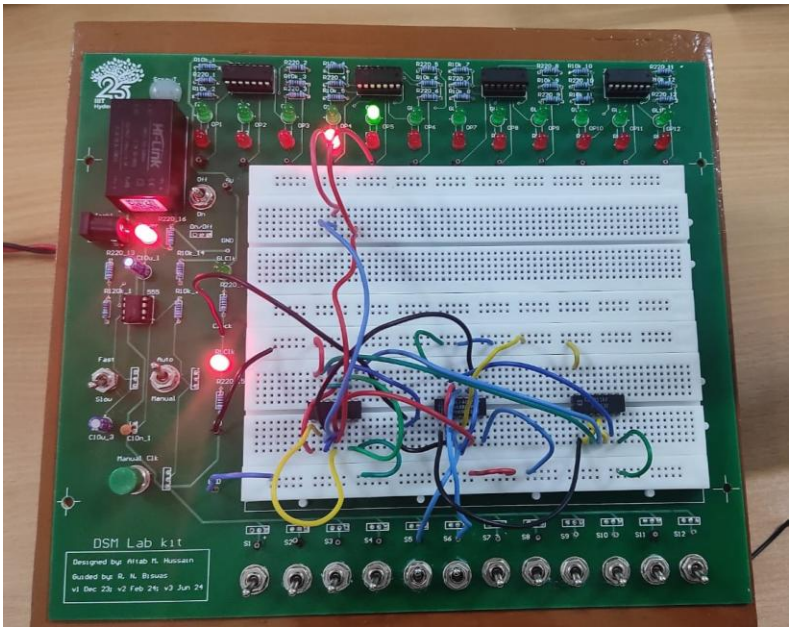
  To create a J-K Flip Flop and observe its function.

- ## Electronic Components Required:-

  1. 7420 4-input NAND gate IC
  2. 7400 2-input NAND gate IC
  3. 7402 2-input NOR gate IC
  4. Digital Test Kit

- ## Reference Circuit:-





- Procedure:-
    1. Ensure that the input pins IP1-12 and output LEDs LG1-12 and LR1-12 are working.
    2. Set the CLOCK of the kit to SLOW mode or Manual mode.
    3. Using the above-mentioned ICs, assemble the circuit as per the given circuit diagram.
    4. Apply all possible combinations of J and K and observe the outputs.
    5. Tabulate the observations and verify the function of the J-K Flip flop.
- Observation:-

    Observed characteristic table of the circuit,

J	**K**	**Q(t+1)**
0	0	Q(t)
0	1	0
1	0	1
1	1	Q’(t)

- Conclusion:-

    A J-K Flip flop has been assembled and its function has been observed.
- TinkerCAD Simulation:-

    https://www.tinkercad.com/things/cCOD9E9mK0A-dsm-lab-6-exp-2?sharecode=zkHdzxTSTKf0m-X_W__gAmhNmPn6RYiz2QeUedzCtbU

Experiment 3:-

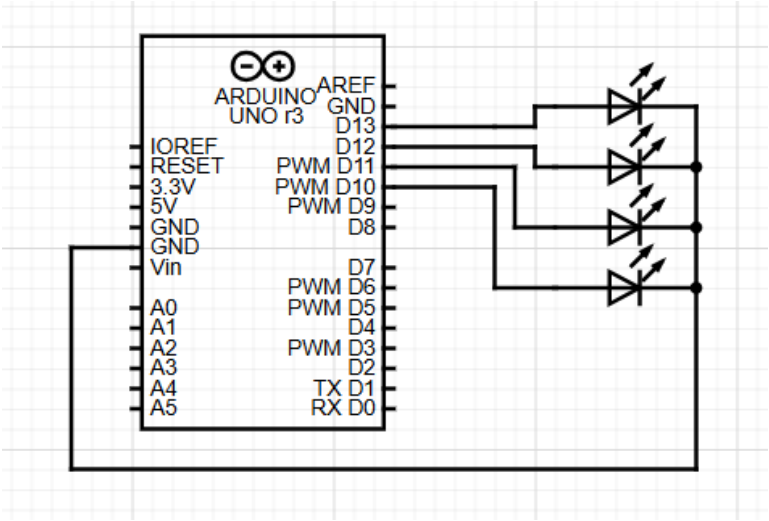
- ## Objective:-

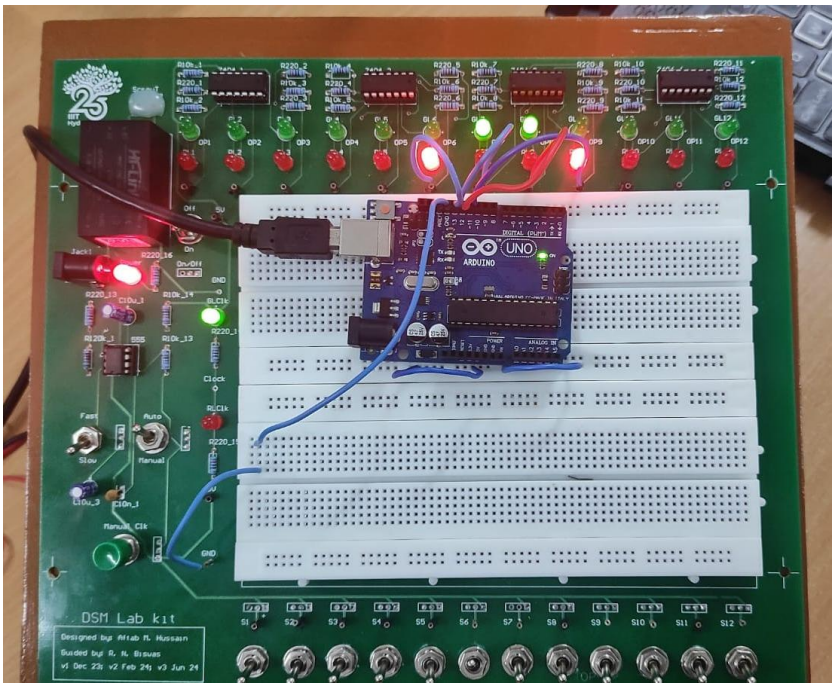
  To design a 4 – bit binary counter using Arduino

- ## Electronic Components Required:-

  - Arduino Uno
  - Digital Test Kit

- ## Reference Circuit:-





- Procedure:-
    1. Connect the Arduino to 4 output LEDs as per the given circuit diagrams.
    2. Write a program to oscillate the output level of the pins, such that each pin has twice the time period of its adjacent pin.
    3. Upload the code and observe the output
- Observation:-

Code of the program,

```
#include "Timer.h"
Timer t;
int pin1 = 7;
int pin2 = 6;
int pin3 = 5;
int pin4 = 4;

void setup() {
  pinMode(pin1, OUTPUT);
  pinMode(pin2, OUTPUT);
  pinMode(pin3, OUTPUT);
  pinMode(pin4, OUTPUT);

  t.oscillate(pin1, 8000, LOW);
  t.oscillate(pin2, 4000, LOW);
  t.oscillate(pin3, 2000, LOW);
  t.oscillate(pin4, 1000, LOW);
}

void loop() {
  t.update();
}
```

- Conclusion:-

  A 4-bit counter has been successfully assembled using the Arduino.

- TinkerCAD Simulation:-

  TinkerCAD does not support the Timer.h library used in the program. Therefore, the code used in the simulation is different. But the basic idea is the same.

  https://www.tinkercad.com/things/ca3EYNGTRjL-dsm-lab-6-exp-3?sharecode=EKSB2RT2Bv1hWBuRSv4DTtsvnatSO2Al-Q6kosErUPE