IT5301

DIGITAL LOGIC AND DESIGN

A MINI PROJECT REPORT

Submitted by

Gowtham Rajasekaran 2022506084

Manobala 2022506081

Samsugani 2022506122

B. Tech (3/8)

DEPARTMENT OF INFORMATION TECHNOLOGY

MADRAS INSTITUTE OF TECHNOLOGY

ANNA UNIVERSITY- CHENNAI

CHENNAI - 600 044

November / December 2023

Universal Shift Registers

AIM:

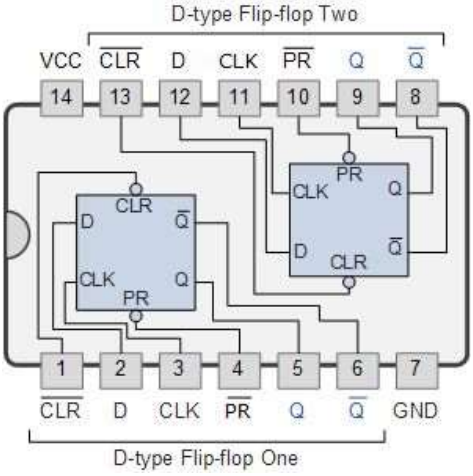
To construct universal shift registers capable of performing all four shift operations: no change, right shift, left shift and parallel load.

SCOPE:

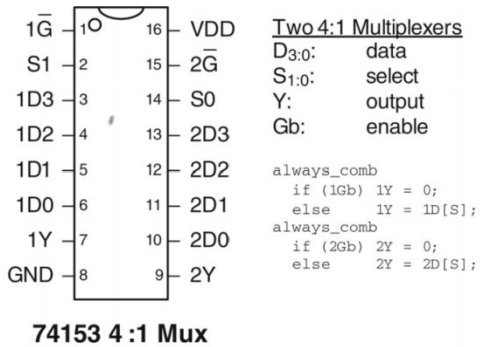
The project involves designing and implementing universal shift registers using D flip-flop IC 7474 and 4x1 multiplexer IC 74153. The scope extends to understanding the principles of shift registers and demonstrating their versatility in various operations.

COMPONENTS USED:

- D Flip-Flop (IC 7474)



- 4x1 Multiplexer (IC 74153)



74153 4 :1 Mux

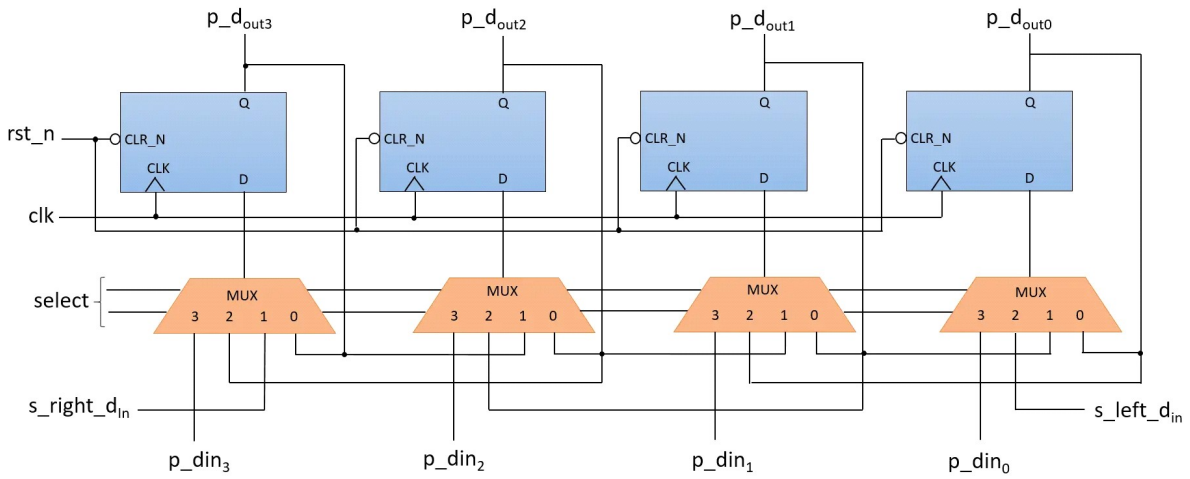
- Connecting wires
- IC Trainer Kit
- I/O pin wires

DESCRIPTION:

The universal shift registers are designed to perform no change, left shift, right shift and parallel load operations. D flip-flops are employed for storage, and a 4x1 multiplexer is used to control the choice of operation. The circuit allows for flexible and efficient data manipulation.

S_1	S_0	Register operation
0	0	No change
0	1	Shift right
1	0	Shift left
1	1	Parallel load

CIRCUIT DIAGRAM:

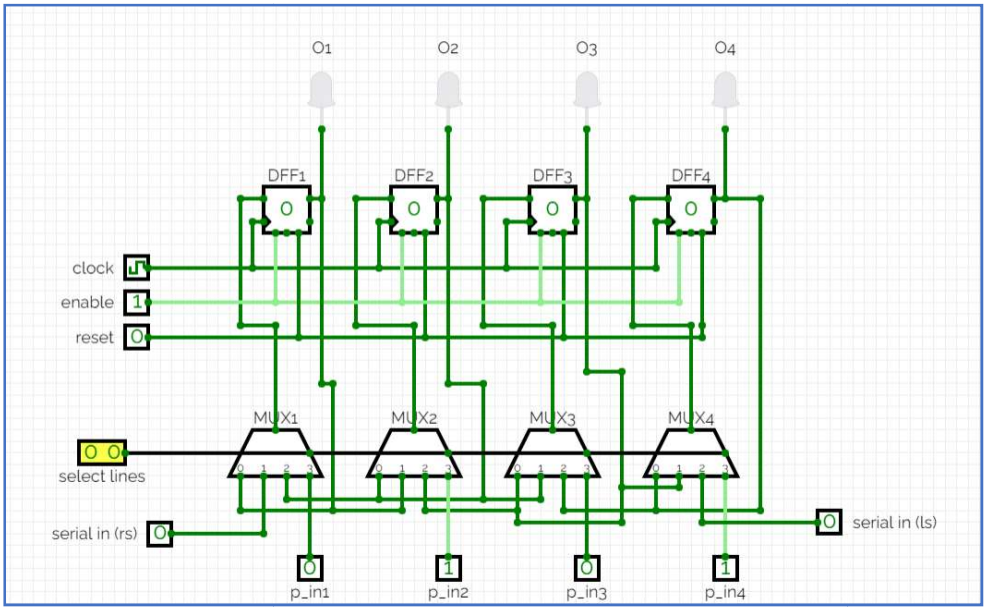


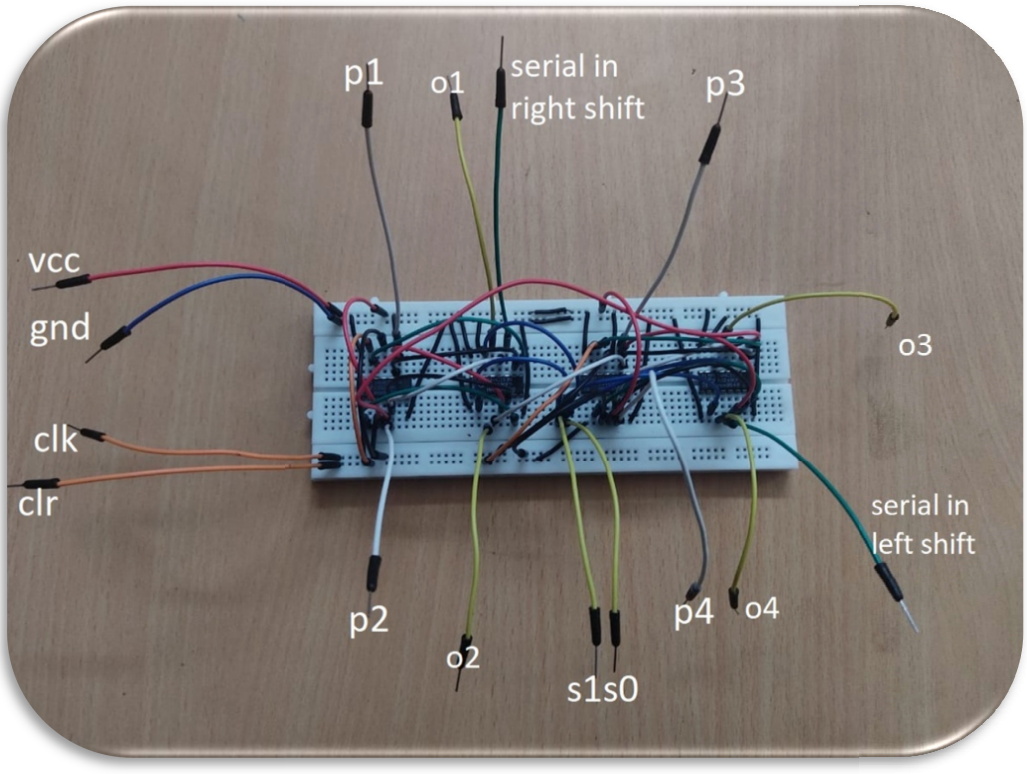
Universal Shift Register

DESIGN METHODOLOGY:

- Utilized D flip-flops for storage and state retention.
- Implemented a 4x1 multiplexer to control the choice of operation.
- Connected the components in a way that enables no change, left shift, right shift and parallel load.

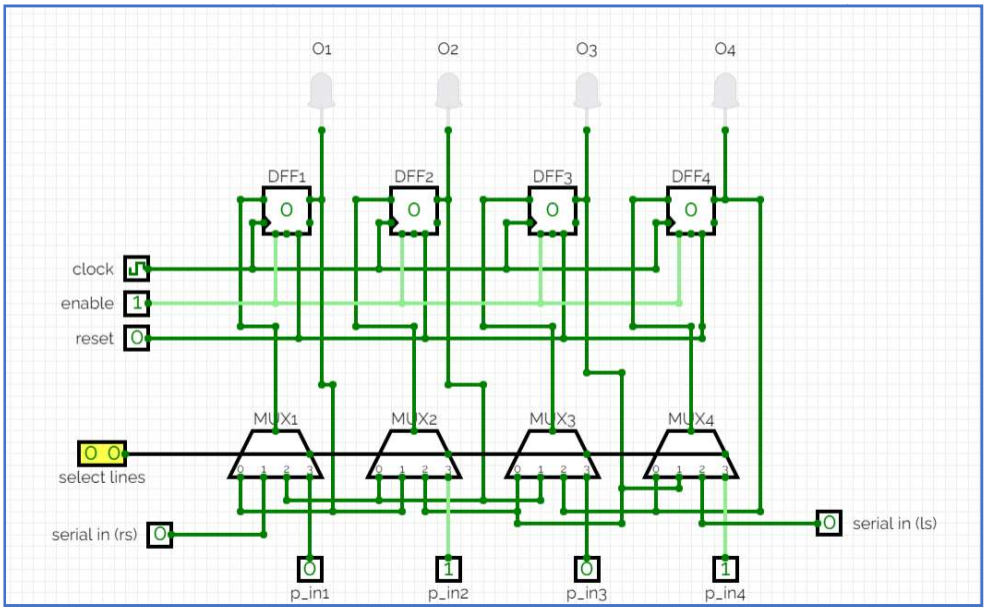
CONSTRUCTION:





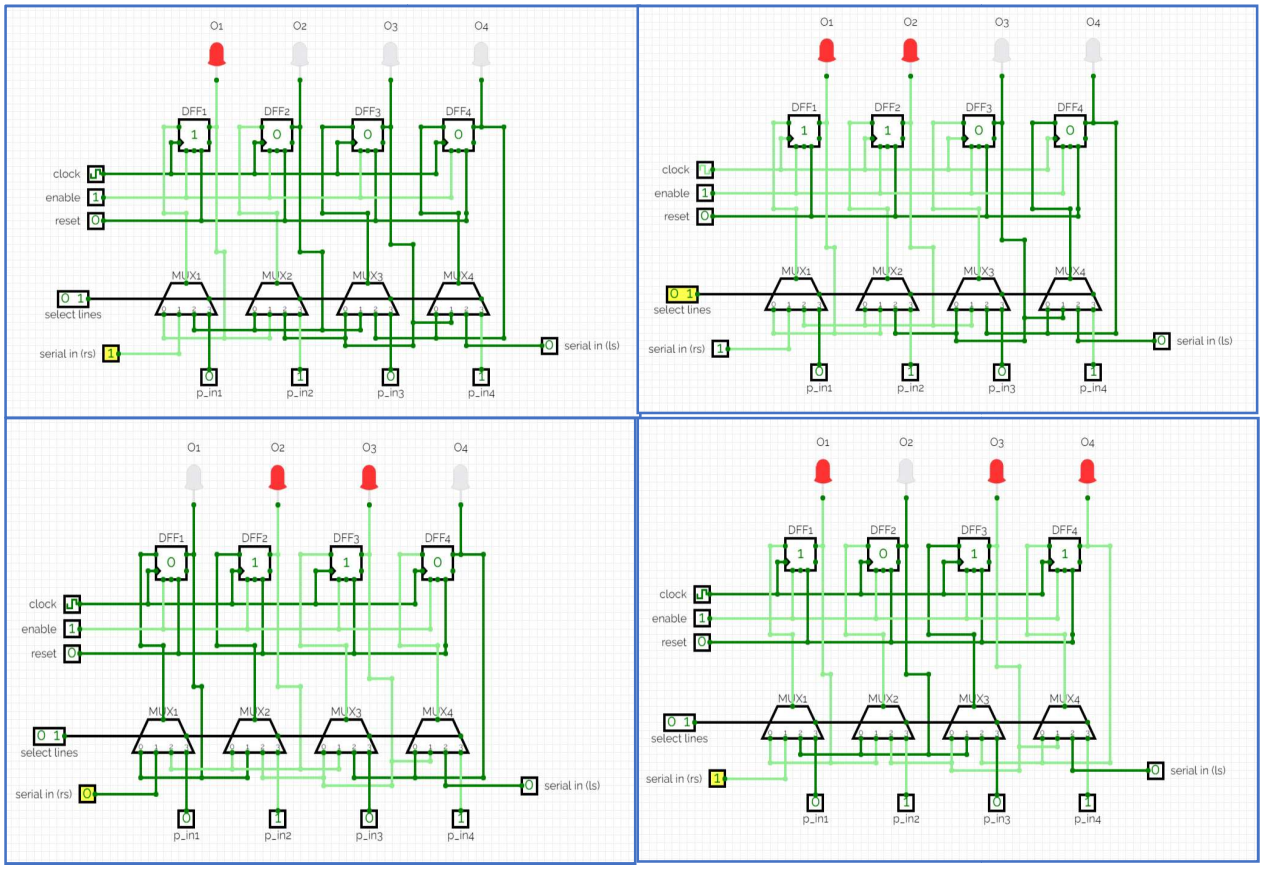
OPERATIONS:

When select lines = 00:

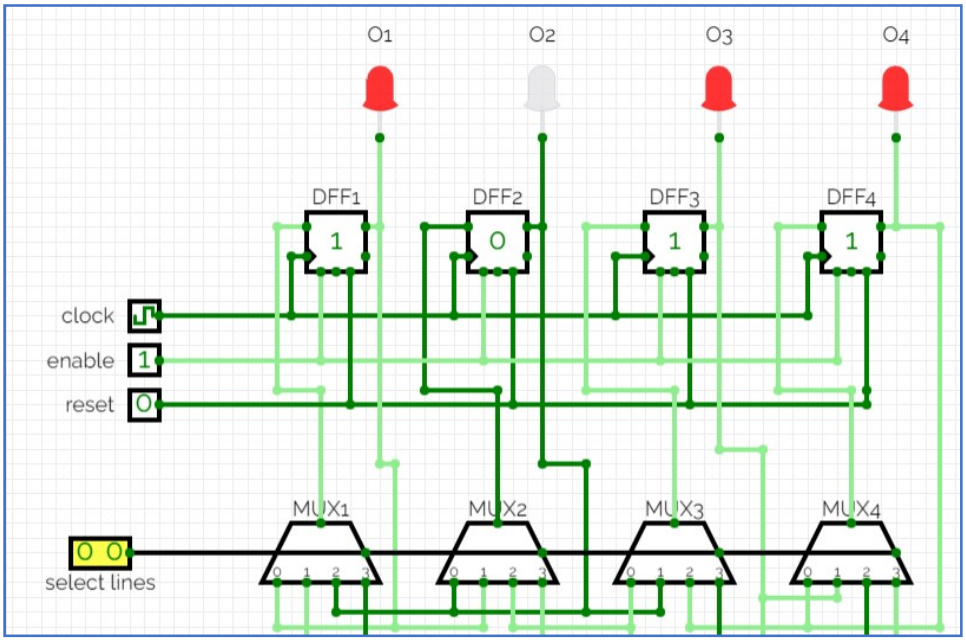


When select lines = 01:

Output for changing serial-in in right shift operation

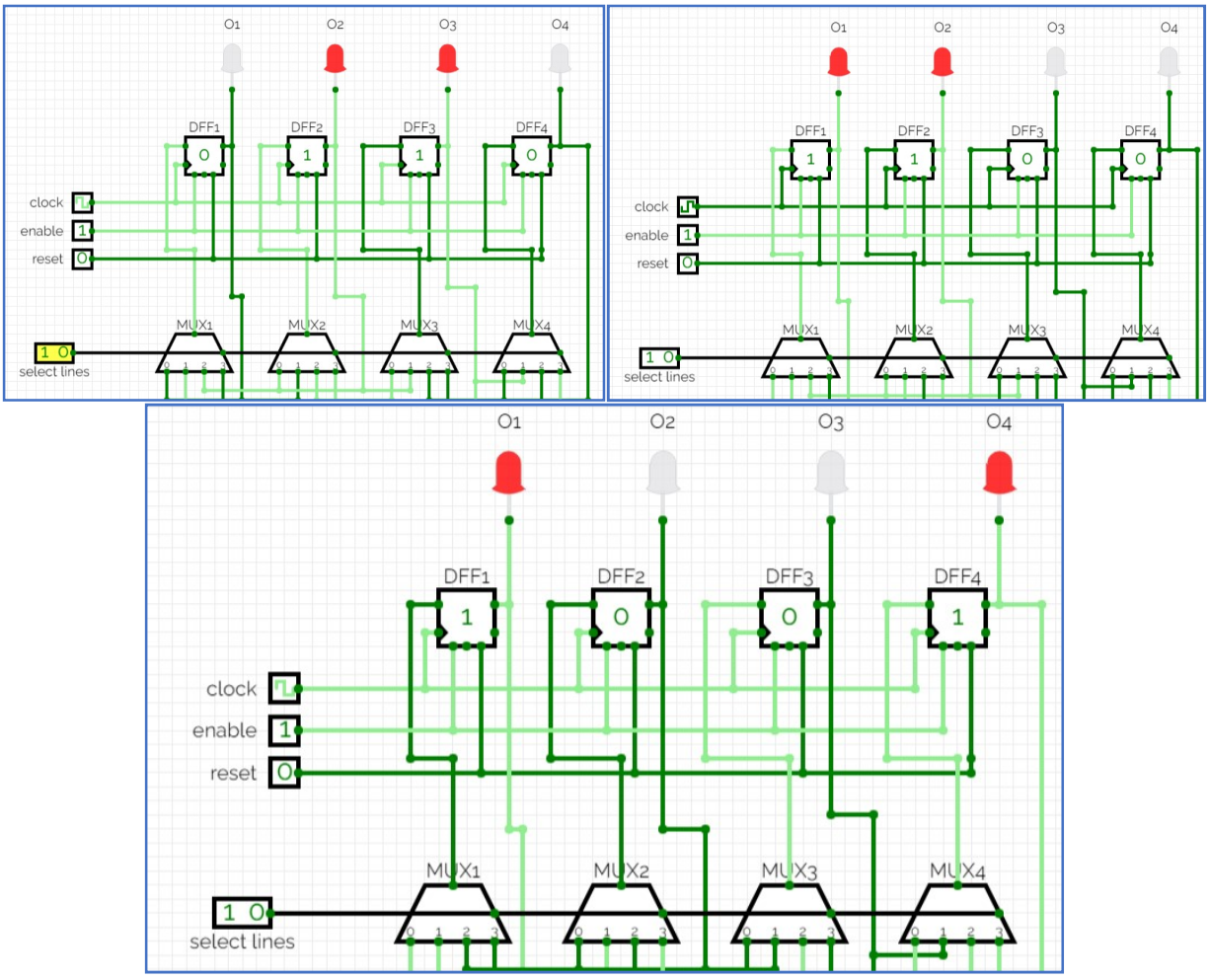


When select lines = 00

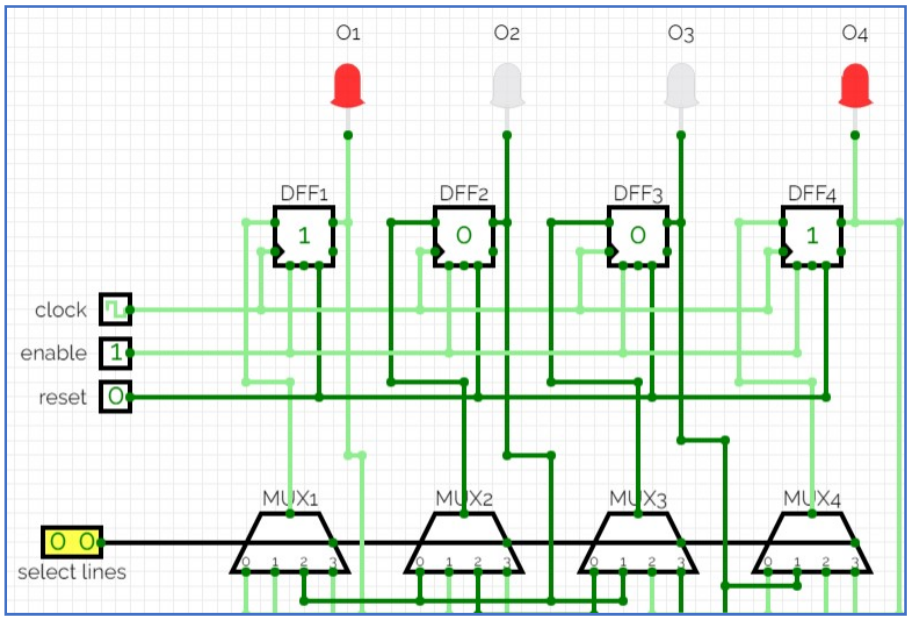


When select lines = 10

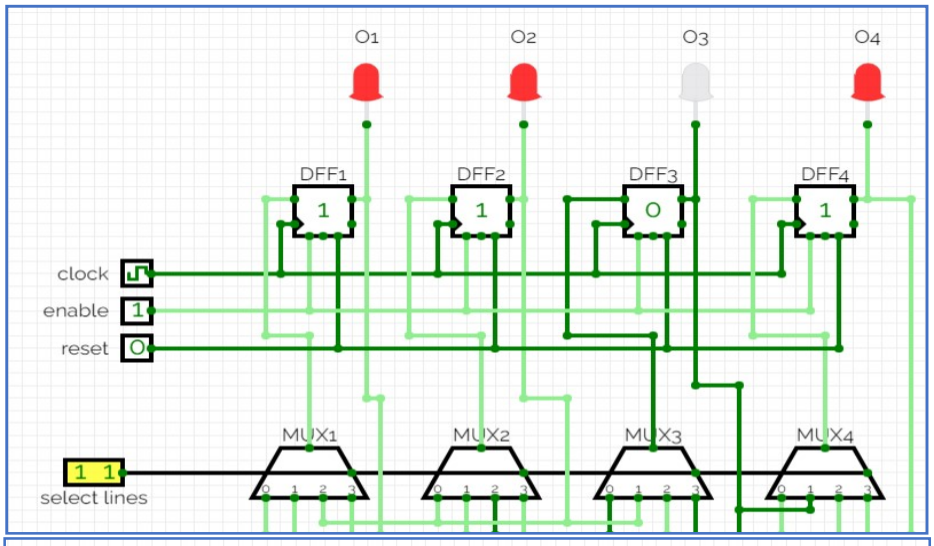
Output for changing serial-in in left shift operation

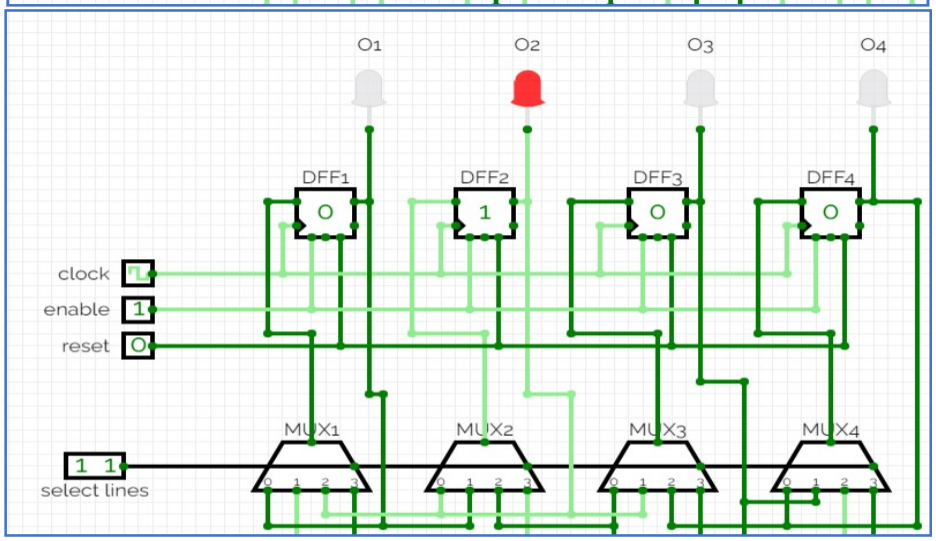


When select lines = 00



When select lines = 11





APPLICATIONS:

Universal shift registers are versatile digital circuits that can perform a variety of operations on binary data. Here are some common applications of universal shift registers:

1. Serial-to-Parallel Conversion:
    - Universal shift registers can convert serial input data into parallel output data. This is useful in applications where data needs to be processed in parallel, such as in the input to microprocessors or memory devices.
2. Parallel-to-Serial Conversion:
    - Conversely, these shift registers can convert parallel input data into serial output data. This is beneficial in scenarios where serial communication is required, such as in communication protocols like SPI or when transmitting data over a single wire.
3. Data Storage and Retrieval:
    - Shift registers are used for temporary storage of data. They can be part of a data storage system where data is shifted in and out for processing or retrieval.
4. Shift Register Counters:
    - By connecting the outputs of a universal shift register in a feedback loop, it can function as a shift register counter. This is useful in applications where counting or sequencing is required, such as in timers or frequency dividers.
5. Digital Signal Processing (DSP):
    - In DSP applications, universal shift registers can be employed for data manipulation and processing. They are useful in filtering, convolution, and other signal processing tasks.
6. LED Displays:
    - Shift registers are commonly used in driving LED displays. By serially shifting data to the shift register, it's possible to control multiple LEDs with a minimal number of input/output pins.

RESULTS:

The universal shift registers were successfully constructed and demonstrated all four operations: no change, right shift, left shift and parallel load.

The project successfully achieved its objective of constructing universal shift registers. The implementation demonstrated the versatility and efficiency of the designed circuit in performing all specified operations. The project enhances understanding of digital logic and design principles, particularly in the context of shift registers.

CONCLUSION:

This project report summarizes the design, implementation, and outcomes of the Mini project – 'Universal Shift Registers' in the `Digital Logic and Design` course.

BIBLIOGRAPHY:

- *Digital Logic and Computer Design M.Morris Mano*
- *Digital Electronics: Principles and Applications by Roger L. Tokheim*
- *IC Datasheets for 7474 and 74153*