AMERICAN INTERNATIONAL UNIVERSITY BANGLADESH

Faculty of Engineering

Laboratory Report Cover Sheet

Students must complete all details except the faculty use part.

Please submit all reports to your subject supervisor or the office of the concerned faculty.

Laboratory Title: Open-Ended Laboratory Experiment on Sequential Logic Circuit Design

Experiment Number: Due Date: 21-04-24 Semester: Spring 23-24

Subject Code:0067 Subject Name: **Digital Logic And Circuits Lab** Section: R

Course Instructor: Md. Ashiquzzaman Degree Program: CSE

Declaration and Statement of Authorship:

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Group Number:03

No.	Student Name	ID	Date
Submitted by:			
1	Takbir Zaman Bhuiyan	22-49852-3	21-04-24
Group Members:			
2	Kazi Imtiaz	22-49857-3	21-04-24
3	Md. Showkat Islam Sakib	22-49858-3	21-04-24
4	Tutul Majumder	23-51364-1	21-04-24
For faculty use only:		**Total Marks:** _____	**Marks Obtained:** _____
Faculty comments			

Title: Object Counter using Flip-Flops.

Purpose:

Object counters utilize flip-flops to track the number of clock pulses over time, specifically employing combinations of J-K Flip-Flops (IC 74LS76) to remember pulse counts. By arranging N flip-flops, a counter can cycle through up to 2*N*2N states, yet often only uses K of these (K ≤ 2*N*2N), known as a modulo K or MOD K counter. This experiment aims to design two types of counters: an n-bit binary asynchronous counter, where each flip-flop is triggered sequentially by the preceding one, and an n-bit binary synchronous counter, where all flip-flops are triggered simultaneously by the same clock pulse. These configurations help illustrate how digital systems manage and utilize counting operations efficiently

Equipment:

SL	Apparatus	Picture	Quantity	Remarks
1.	Digital trainer board.		1	Good condition
2.	Integrated Circuits (ICs) And Gate(7432) NAND Gate(740032)		4 2	Good condition.
3.	Connecting wires		multiple	Good condition
4.	IC 74LS76 (JK Flip Flop)		2	Good condition
5.	LED		4	Good condition

Experimental Procedure:

1. Designed the circuit on the bread board as shown in Figure 1.
2. Used the trainer board's signal generator for the clock pulse and power supply for biasing the Flip Flops.
3. Connected the LEDs to the outputs of each flip-flop to monitor state changes visually
4. Observed the output results, recorded them and also took pictures for lab report.

Hardware Setup:

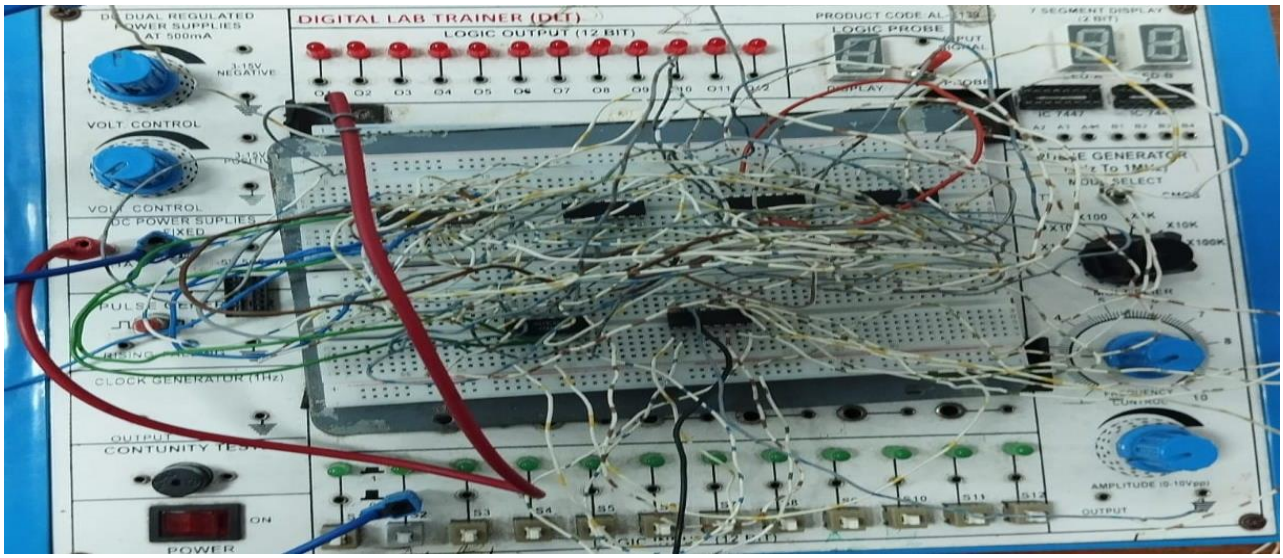

Fig 1a: 2-bit Object Counter

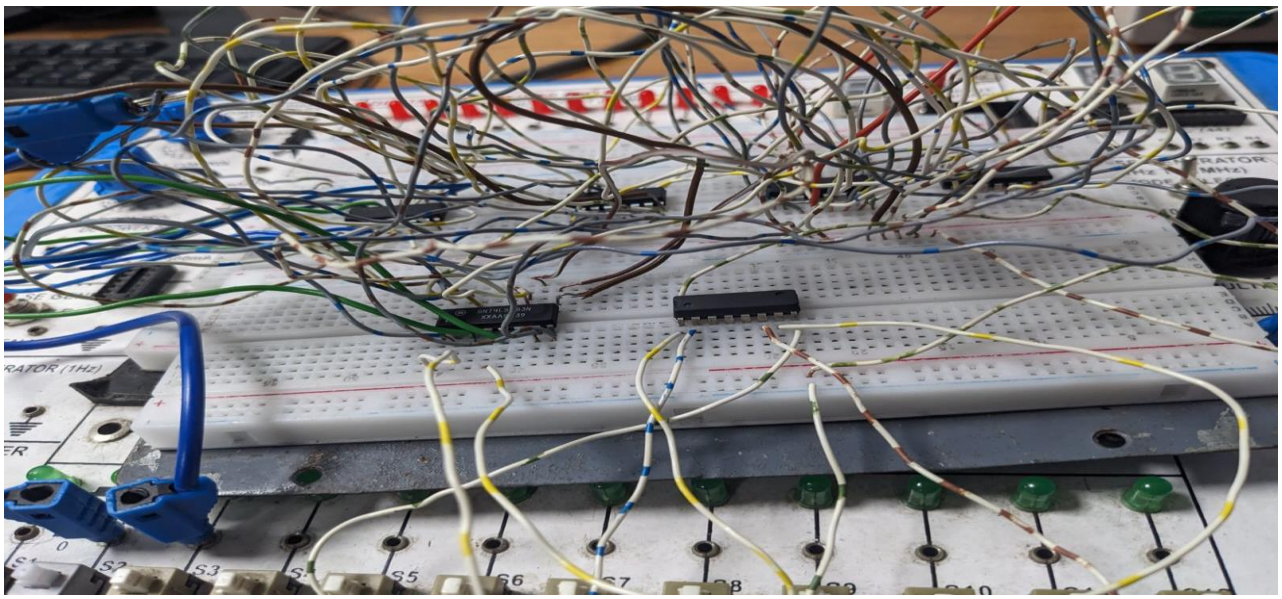

Fig 1b: 2-bit object Counter

Results and Data analysis:

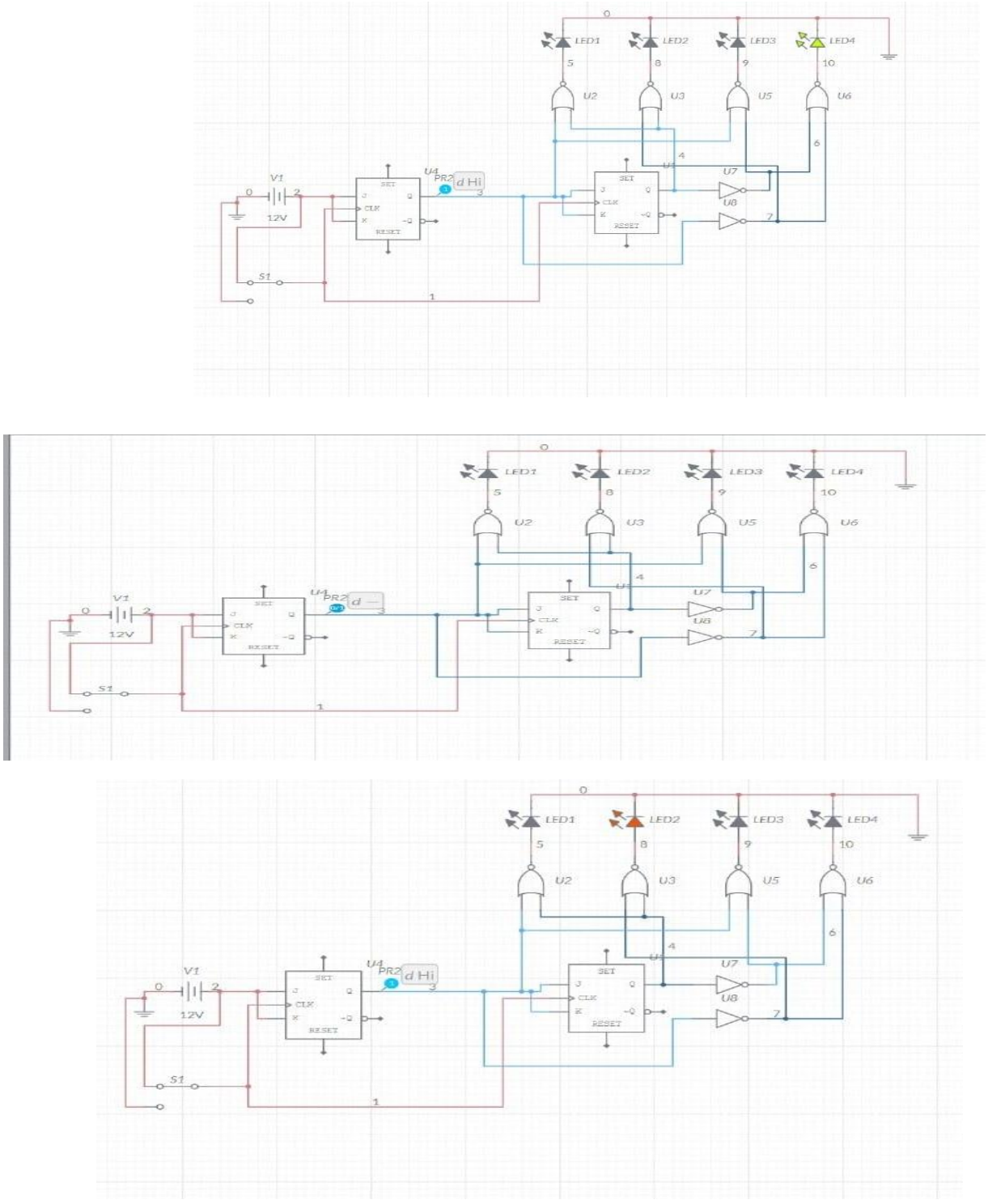

Fig 3: 2-Bit object Counter

Discussion

During the experiment aimed at designing and testing an n-bit binary synchronous counter using J-K Flip-Flops (IC 74LS76), time constraints hindered our ability to complete the physical project within the allotted timeframe. However, we successfully conducted a comprehensive simulation of the counter using Multisim 14.3, which validated the feasibility of our design under ideal conditions. The challenges encountered in the physical setup, particularly in synchronizing clocks across multiple flip-flops and implementing correct reset logic, proved time-consuming. This experience underscored the importance of utilizing simulation tools like Multisim early in the design process to anticipate and address potential issues. Moving forward, we aim to refine the timing mechanisms and reset logic based on our simulation findings and conduct thorough testing of the physical counter to ensure its reliability and efficiency under real-world conditions.

Conclusion

In conclusion, while the experiment to design and test an n-bit binary synchronous counter using J-K Flip-Flops (IC 74LS76) faced challenges and ultimately could not be completed within the designated timeframe, it provided valuable insights and learning opportunities. Successfully conducting a thorough simulation using Multisim 14.3 demonstrated the feasibility of the counter's design under ideal conditions and emphasized the importance of simulation tools in the early stages of project development. The complexities encountered during the physical setup highlighted the need for meticulous planning and time management in digital electronics projects. Moving forward, the experience gained from this experiment will inform future endeavors, guiding us in refining designs, optimizing testing procedures, and effectively utilizing simulation tools to overcome challenges and achieve project objectives efficiently. Through continued exploration and experimentation, we aim to enhance our understanding of digital circuit design principles and develop practical solutions that meet the demands of real-world applications.

References:

[1] www.tutorialspoint.com
[2] www.electronics-tutorials.ws
[3] faculty.kfupm.edu.sa
[4] “Digital Fundamentals” by Thomas L. Floyd

Marking Rubrics (to be filled by Faculty)

	Objectives	Unsatisfactory (0-1)	Good (2-3)	Excellent (4-5)	Marks
Reports (10)	**Identify experiment goals**	Cannot identify goals	Can identify some goals but unable to draw adequate hypothesis	Can identify necessary and sufficient goals	
	Setup of experiment	Cannot setup experiment without support	Can setup some of the portions of experiment without support	Can setup the whole experiment without support	
	Take organized and accurate measurement	Cannot take measurements	Can take measurements but inaccurately	Can take organized and accurate measurements	
	Summarize findings and compare actual to expected results	Cannot summarize or compare findings to expected results	Summarize finding in an incomplete way	Summarize finding in a complete way	
	Assessed by (Name, Sign, and Date)		**Total:**	**Comments**	

Group Members

Sl #	ID Number	Name	Marks in Demonstration	Marks in Report
1.	22-49852-3	Takbir Zaman Bhuiyan		
2.	22-49857-3	Kazi Imtiaz		
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