# DIGITAL LOGIC

## LAB 3 ASSIGNMENT REPORT


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# IDENTIFYING THE PROPERTIES OF A SYNCHRONOUS COUNTER

**OBJECTIVES**

1. IMPLEMENT A SYNCHRONOUS COUNTER CIRCUIT USING DEED SOFTWARE.
2. COMPLETING THE NEXT-STATE TABLE.
3. TRUTH TABLE.
4. IDENTIFY THE PROPERTIES OF THE COUNTER.

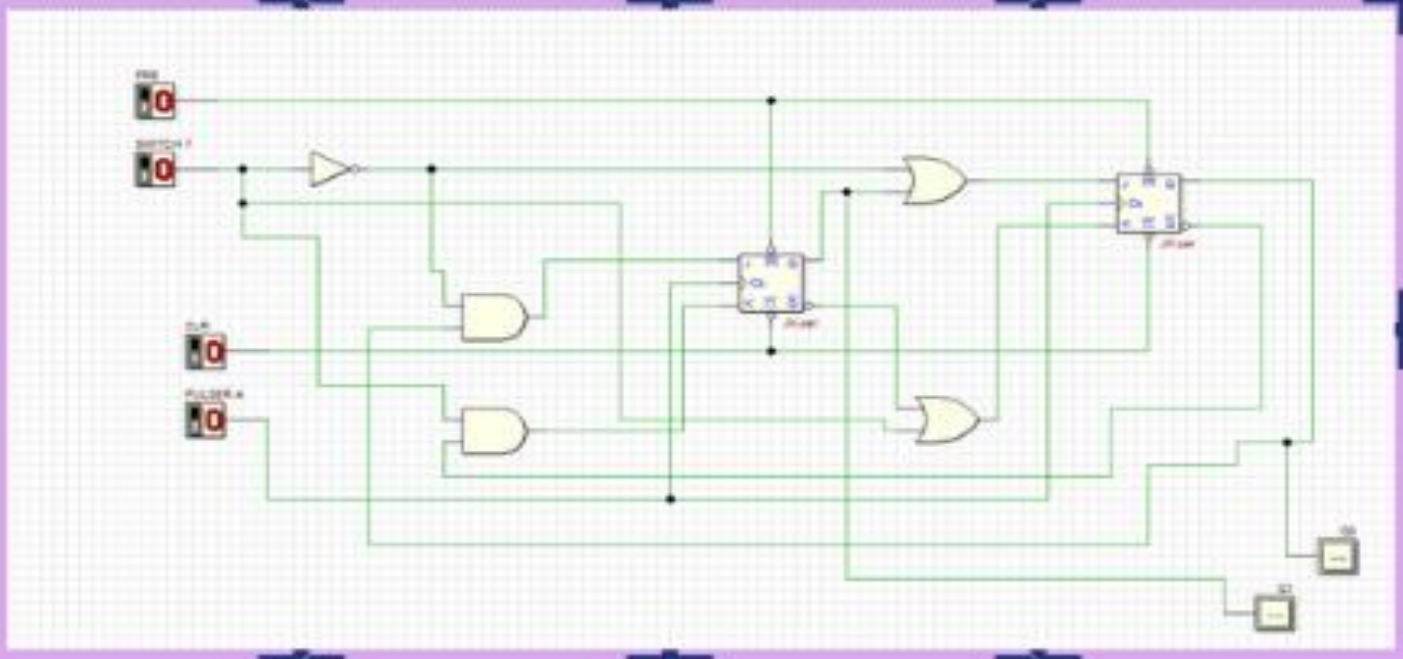
**INTRODUCTION**

SYNCHRONOUS COUNTERS ARE ESSENTIAL COMPONENTS IN DIGITAL CIRCUIT DESIGN, SERVING VARIOUS FUNCTIONS FROM FREQUENCY DIVISION TO SEQUENTIAL OPERATIONS. IN THIS REPORT, WE EXPLORE THE PROPERTIES OF A SYNCHRONOUS COUNTER THROUGH PRACTICAL IMPLEMENTATION AND ANALYSIS.

OUR OBJECTIVES INCLUDE IMPLEMENTING A SYNCHRONOUS COUNTER CIRCUIT USE STATE DIAGRAM, BY UNDERSTANDING THE BEHAVIOR OF ATERENT FAHING FLOP TYPES WITHIN THE COUNTER, SUCH AS JK, SR, AND D FLIP-FLOPS, WE AIM TO ELUCIDATE THE FUNDAMENTAL PRINCIPLES GOVERNING ITS OPERATION.

THROUGH EXPERIMENTATION AND ANALYSIS, WE WILL OBSERVE THE BEHAVIOR OF THE COUNTER UNDER VARIOUS CONDITIONS AND IDENTIFY KEY INDICATORS DISTINGUISHING SYNCHRONOUS COUNTERS. THIS REPORT PROVIDES A COMPREHENSIVE UNDERSTANDING OF SYNCHRONOUS COUNTERS, BRIDGING THEORETICAL CONCEPTS WITH PRACTICAL IMPLEMENTATION FOR DIGITAL CIRCUIT

# IMPLEMENTING A SYNCHRONOUS COUNTER CIRCUIT USING DEED SOFTWARE



## COMPLETING THE NEXT-STATE TABLE OF THE COUNTER CIRCUIT

| Switch 7 | Present State | | Next State | |
|---|---|---|---|---|
| X | Q 1 LED 1 | Q 0 LED 0 | Q 1 LED 1 | Q 0 LED 0 |
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 |

## TRUTH TABLE

| Desired Result | PRE | CLR | J | K | CLK | Q |
|---|---|---|---|---|---|---|
| Set initial value Q = 1 | 0 | 1 | X | X | -- | 1 |
| Output Q stays the same | 1 | 1 | 0 | 0 | ↓ | 1 |
| Output Q become 0, no change in asynchronous | 1 | 1 | 0 | 1 | ↓ | 0 |
| output Q is not the previous Q | 1 | 1 | 1 | 1 | ↓ | 1 |
| RESET Q | 1 | 1 | 0 | 1 | ↓ | 0 |
| SET Q | 1 | 1 | 1 | 0 | ↓ | 1 |

# CONCLUSION

IN SUMMARY, OUR EXPLORATION OF SYNCHRONOUS COUNTERS HAS YIELDED SIGNIFICANT INSIGHTS INTO THEIR FUNCTIONALITY. BY CONDUCTING PRACTICAL EXPERIMENTS AND ANALYZING THEIR BEHAVIOR, WE'VE GAINED A DEEPER UNDERSTANDING OF HOW THESE COUNTER CIRCUITS OPERATE SEQUENTIALLY.

REGARDING THE CIRCUIT'S FUNCTIONALITY, THE SYNCHRONOUS COUNTER FACILITATES SEQUENTIAL COUNTING BY FOLLOWING A PREDEFINED SEQUENCE OF STATES. IT SYNCHRONIZES ITS OPERATIONS WITH CLOCK SIGNALS, ENSURING ACCURATE TIMING THROUGHOUT THE COUNTING PROCESS.

NOTEWORTHY FEATURES OF THE CIRCUIT INCLUDE SEQUENTIAL COUNTING CAPABILITIES, SYNCHRONOUS OPERATION MODE, IMPLEMENTATION OF NEXT-STATE LOGIC, AND THE ABILITY TO CONTROL INPUTS USING SWITCHES.

IN ESSENCE, THE SYNCHRONOUS COUNTER CIRCUIT PLAYS A CRUCIAL ROLE IN DIGITAL CIRCUIT DESIGN, OFFERING RELIABILITY AND VERSATILITY ACROSS VARIOUS APPLICATIONS.