

A
Assignment on
“ Digital Dice ”

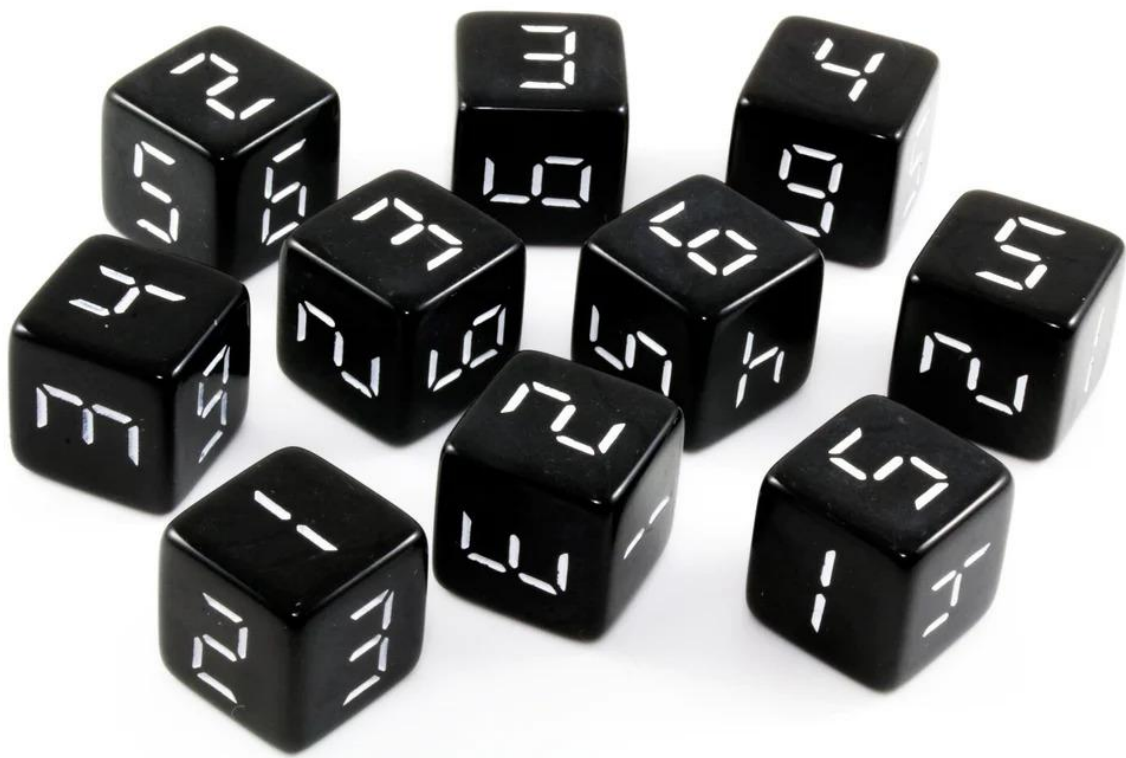


Table Of Contents

No.	Topic	Page No
1)	Introduction.....	3
2)	Analyzing Problem.....	4
3)	Solution.....	5
4)	Components.....	9
5)	Circuit Diagram.....	12
6)	Learning Outcome.....	13

Introduction

Welcome to the realm where classic dice games meet the digital age! The Digital Dice project is an exciting exploration of electronics, transforming the traditional dice into a versatile electronic marvel. Traditionally, dice have been essential components in various games and educational scenarios, offering a random element crucial for fair play and learning experiences. However, the digital dice project takes this fundamental concept to a new level by replacing physical dice with a digital, electronically-controlled counterpart.

Join us on this exciting adventure as we blend the nostalgic appeal of rolling dice with the precision and adaptability of digital technology. The Digital Dice project not only promises a deeper understanding of electronics but also invites you to be a part of the evolution of a classic gaming element in the digital era. we invite enthusiasts to roll the dice and discover the fascinating intersection of electronics and gaming in the digital age. Let the journey begin!

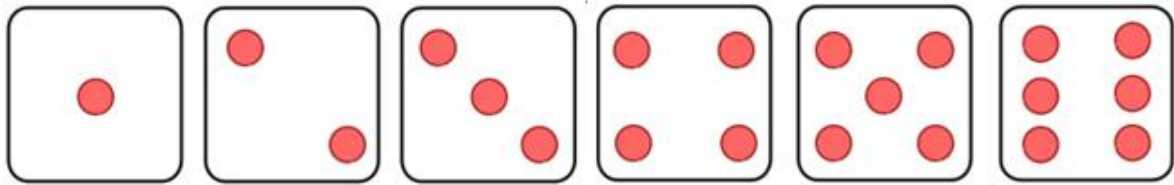
Analyzing Problem

Traditional dice have been effective tools for generating random outcomes in games for centuries, and their simplicity and tactile nature contribute to their widespread use. Though Traditional dice have several limitations that digital dice can overcome.

Traditional dice require a flat surface to roll on and can be easily lost or damaged. They are typically limited to six sides. Traditional dice can be biased due to imperfections in their manufacturing or wear and tear over time. This can affect the probability of rolling a particular number. It can be difficult to accurately read the results of a traditional dice roll, especially in low-light conditions or if the dice are small.

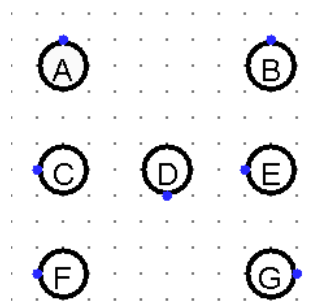
Solution

Normal Digital Dice is looks like :



- In Digital Dice , Random Number Generator is used to generate random number and can be used to display it as a Dice structure.
- Button is used to generate random number when the button is clicked.
- For the Dice structure , 7 LEDs are used here and turned ON or OFF according to random number generated by Random Generator which is splitted by splitter.

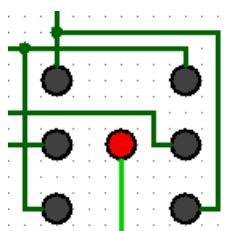
We have used 7 LEDs like this :



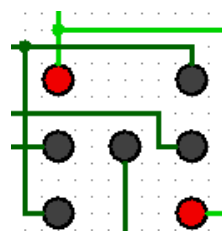
- So, we have to give output for 1 to 6 that has been generated randomly

- **Output for all numbers :**

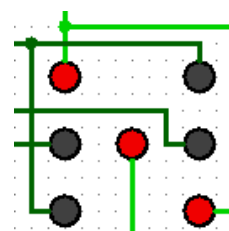
For 1 :



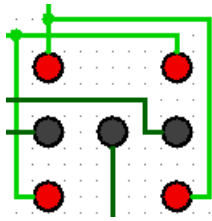
For 2 :



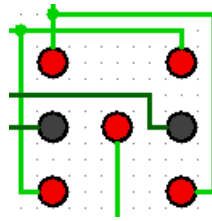
For 3 :



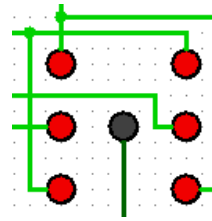
For 4 :



For 5 :



For 6 :



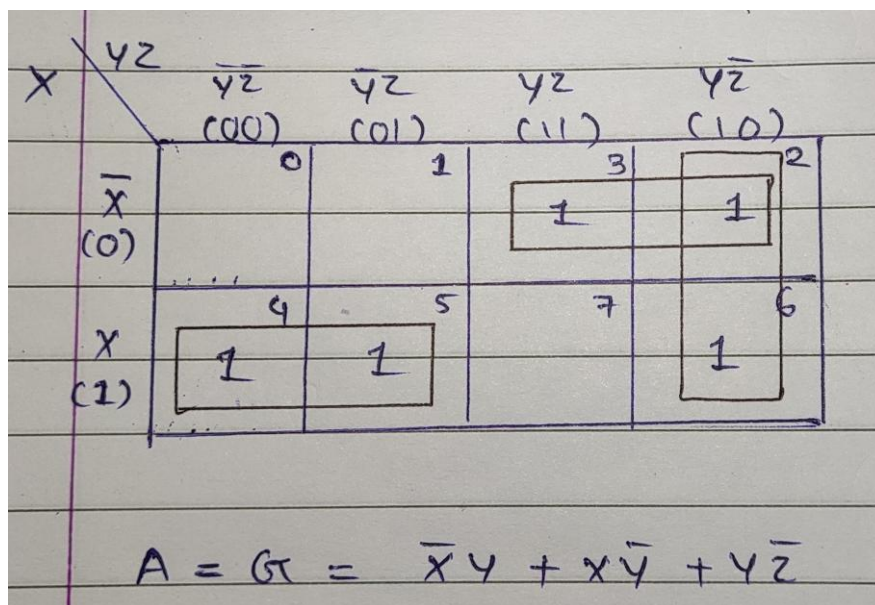
Expression Evaluation for Above LEDs :

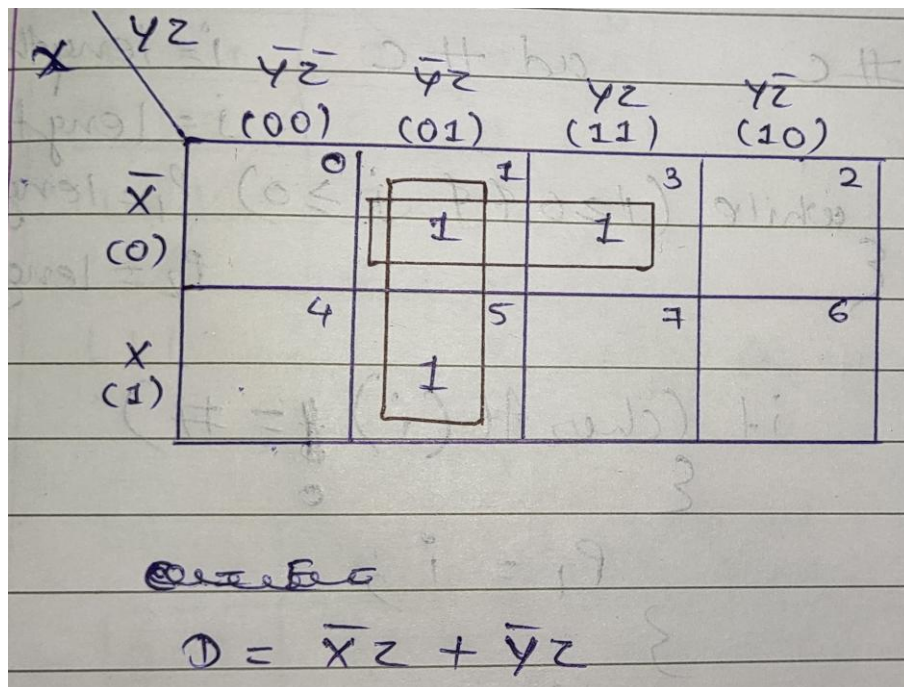
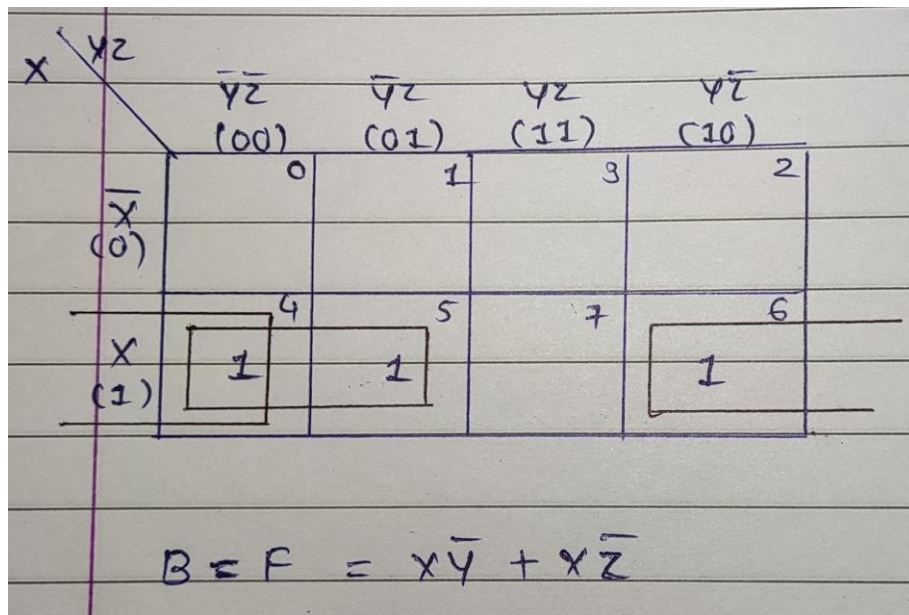
➤ Truth Table :-

Input			Output						
X	Y	Z	A	B	C	D	E	F	G
0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0	0	0
0	1	0	1	0	0	0	0	0	1
0	1	1	1	0	0	1	0	0	1
1	0	0	1	1	0	0	0	1	1
1	0	1	1	1	0	1	0	1	1
1	1	0	1	1	1	0	1	1	1
1	1	1	0	0	0	0	0	0	0

➤ Expression Evaluation :-

Here $A = G$, $B = F$, $C = E$

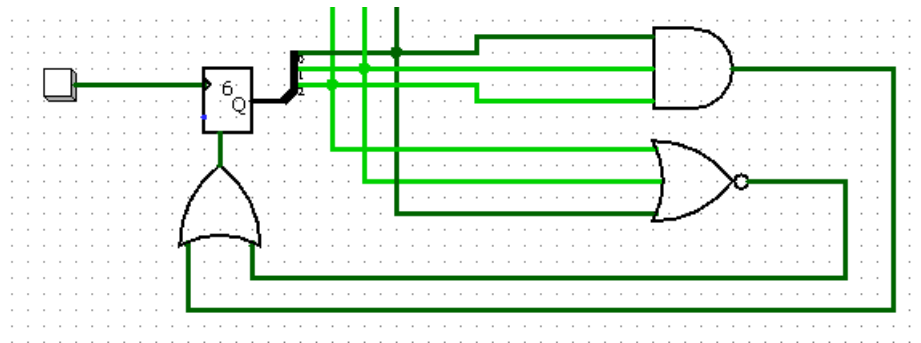




➤ Expressions :

$$\begin{aligned}
 A &= G = \bar{x}y + x\bar{y} + y\bar{z} \\
 B &= F = x\bar{y} + x\bar{z} \\
 C &= E = xy\bar{z} \\
 D &= \bar{x}z + \bar{y}z
 \end{aligned}$$

- We have used following circuit to clear the Random Number Generator for Number 0 and 7 because in normal dice 1 to 6 numbers are used.



- We also have used Hex Digit Display to give number as output for more clarity about the dice's output.

Components

1. Button :

- A button, also known as a Push Button. It is a simple input device that is commonly used to control electronic circuits. It is a manually operated switch that typically has two states: Pressed (Closed) and Released (Open). When a button is pressed, it allows electric current to flow through the circuit; when released, it interrupts the flow of current.

2. Random Generator :

- Random Number Generator is a device or circuit that generate random numbers. It produces sequences that appear random for practical purposes. These generators are considered to be truly random because their output is not predictable.

3. Splitter :

- A Splitter is a device that takes a single input signal and replicates it into multiple output signals. Splitters are used in a variety of applications. The primary purpose of a splitter is to distribute a signal to multiple destinations without significantly degrading the quality of the signal.

4. AND Gate :

- An AND gate is a fundamental logic gate that performs a logical Conjunction operation. The output of an AND gate is high (logic 1) only when all of its inputs are high; otherwise, the output is low (logic 0). The AND gate follows the truth table :

Input		Output
A	B	A.B
0	0	0
0	1	0
1	0	0
1	1	1

- The logic expression for the AND gate is often written as $Y=A \cdot B$ where “.” represents the logical AND operation.

5. OR Gate :

- An OR gate is a basic logic gate that performs the logical OR operation on two or more input signals. The OR gate has two inputs and one output. The output of the OR gate is true if any or all of the inputs are true. Otherwise, the output of the OR gate is false. The OR gate follows the truth table:

Input		Output
A	B	A+B
0	0	0
0	1	1
1	0	1
1	1	1

- The logic expression for the OR gate is often written as $Y=A+B$, where “+” represents the logical OR operation.

6. NOT Gate :

- The NOT gate performs a logical NOT operation. The output is the complement of the input, i.e., if the input is high (1), the output is low (0), and vice versa. The NOT gate follows the truth table:

Input	Output
A	A'
0	1
1	0

- The logic expression for the NOT gate is often written as $Y=A'$ represents the logical NOT operation.

7. NOR Gate :

- A NOR gate (also known as a NOT-OR gate) is a digital logic gate that implements the logical NOR operation, a logical operation that produces a true output only if both of its inputs are false. The NOR gate follows the truth table:
- The logic expression for the NOR gate is often written as $Y=(A+B)'$.

Input		Output
A	B	$(A+B)'$
0	0	1
0	1	0
1	0	0
1	1	0

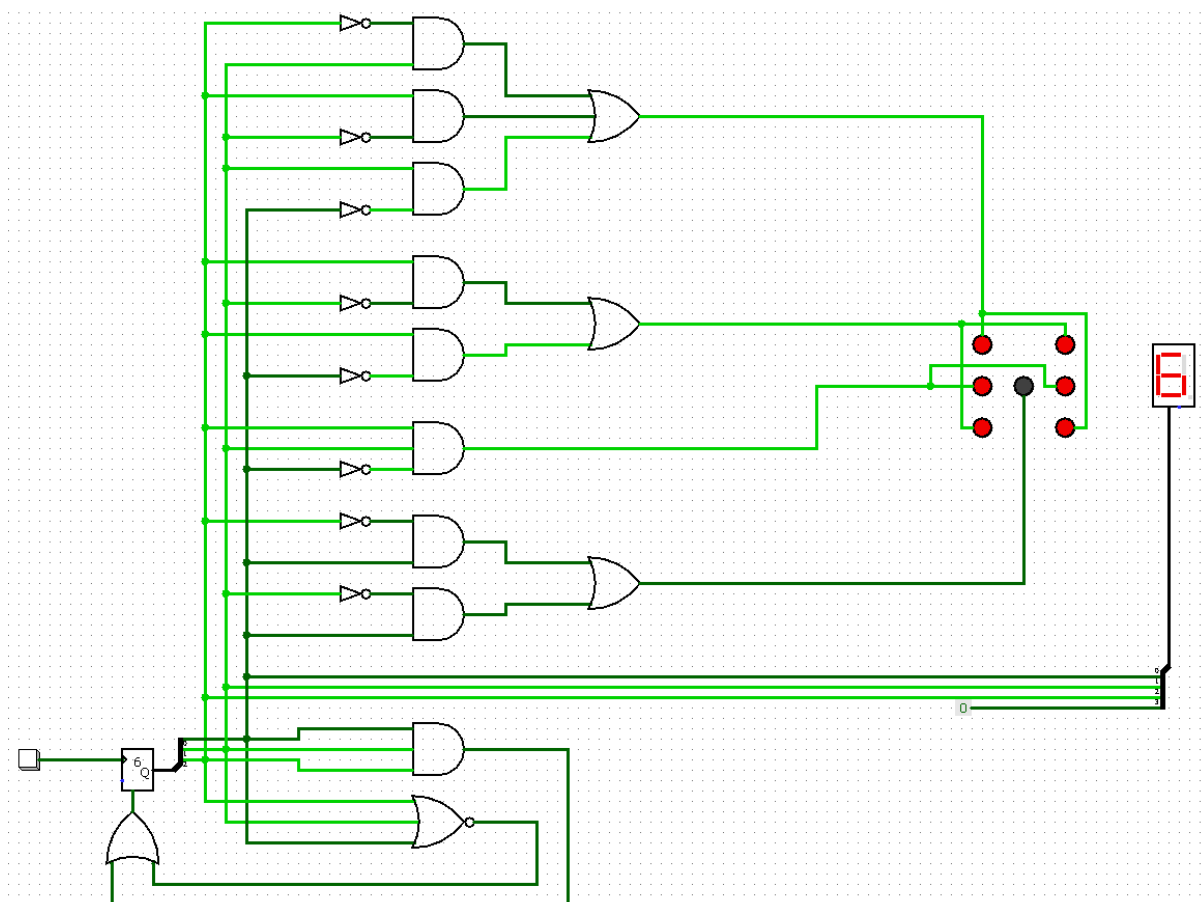
8. LED :

- Light Emitting Diodes (LEDs) are widely used as visual indicators to convey the status or output of electronic circuits. LEDs are semiconductor devices that emit light when an electric current passes through them. LEDs convert a high percentage of electrical energy into light energy, so they are very efficient and consume very little power.

9. HEX Digit Display :

- A Hex Digit Display, often referred to as a 7-segment display or simply a hex display, is a common type of electronic component used to visually represent hexadecimal digits (0-9 and A-F) in digital systems. It consists of seven LED segments arranged in a specific pattern to form the shape of these digits. Each segment can be individually controlled to display different combinations, allowing the representation of various alphanumeric characters.

Circuit Diagram



Learning Outcome

Making an digital dice provides a hands-on opportunity to learn about designing digital circuits, and generating random numbers. We've gain practical experience in connecting electronic components and creating a user-friendly interface with a button for rolling the dice. Crafting an digital dice opens a door towards understanding of electronics and probability. This hands-on project have helped us in developing creativity and independent work skills. Overall, building an electronic dice is a fun and engaging way to learn and apply various skills in electronics.