Digital Dice

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Introduction to Digital Dice:

Digital dice are revolutionary electronic devices that elegantly replicate the timeless experience of rolling traditional dice, harnessing the boundless power of cutting-edge digital technology. Merging convenience, unwavering reliability, and unparalleled versatility, these ingenious dice transcend the limitations of their physical counterparts. Our tireless pursuit of perfection led us to meticulously craft this awe-inspiring project on the esteemed platform of Proteus. After relentless iterations and unwavering dedication, we triumphantly unlocked the pinnacle of innovation, materializing our vision into a tangible marvel on a breadboard, breathing life into our most extraordinary creation yet.

Components of Digital Dice:

These are the Components that we used in making digital dice

- Counter IC 4017
- 555 IC
- 330 ohms Resistors (2)
- LEDs (6)
- Switch
- Bread Board
- Jumper Wires
- 10 micro farad Capacitor
- 1k Resistor
- 9V battery with connector

Details of Components:

Counter IC 4017:

It is decade counter IC.

Pin Number	Pin Name	Description
1 to 7 and 9,10,11	Output pins Q0 to Q9	These are the 10 output pins on which the counting occurs, they are not in order hence verify pin diagram above
8	Vss or Ground	Connected to the Ground of the circuit
12	Carry Out (CO)	This pin goes high after the IC counts from 1 to 10. This is used as carry while counting.
13	Clock Enable (EN)	This is an input which when made high will hold the count at the current state
14	Clock	The counting happens when this clock pulse goes high , this pin is normally connected to 555 timer or other uC to produce a pulse
15	Resets	As the name suggests this pin resets the count back to 1
16	Vdd / Vcc	Connects to the supply voltage typically +5V

555 IC:

It has 8 pins but we are not using pin 5. We are using it in **Astable mode** The detail of other pins in following.

Pin Number	Pin Name	Purpose
1	GND	Ground reference voltage, low level (0 V)
2	TRIG	The OUT pin goes high and a timing interval starts when this input falls below 1/2 of CTRL voltage (which is typically 1/3 Vcc, CTRL being 2/3 Vcc by default if CTRL is left open). In other words, OUT is high as long as the trigger is low. The output of the timer totally depends upon the amplitude of the external trigger voltage applied to this pin.

3	OUT	This output is driven to approximately 1.7 V below +Vcc, or to GND.
4	RESET	A timing interval may be reset by driving this input to GND, but the timing does not begin again until RESET rises above approximately 0.7 volts. Overrides TRIG which overrides threshold.
5	CTRL	Provides “control” access to the internal voltage divider (by default, 2/3 Vcc).
6	THR	The timing (OUT high) interval ends when the voltage at the threshold is greater than that at CTRL (2/3 Vcc if CTRL is open).
7	DIS	Open collector output which may discharge a capacitor between intervals. In phase with output.
8	Vcc	Positive supply voltage, which is usually between 3 and 15 V depending on the variation

Bread Board:

Whole project is made on bread board.

Jumper Wires:

Used for connections.

Resistors and Capacitor:

To provide resistance so that the LEDs would not burn.

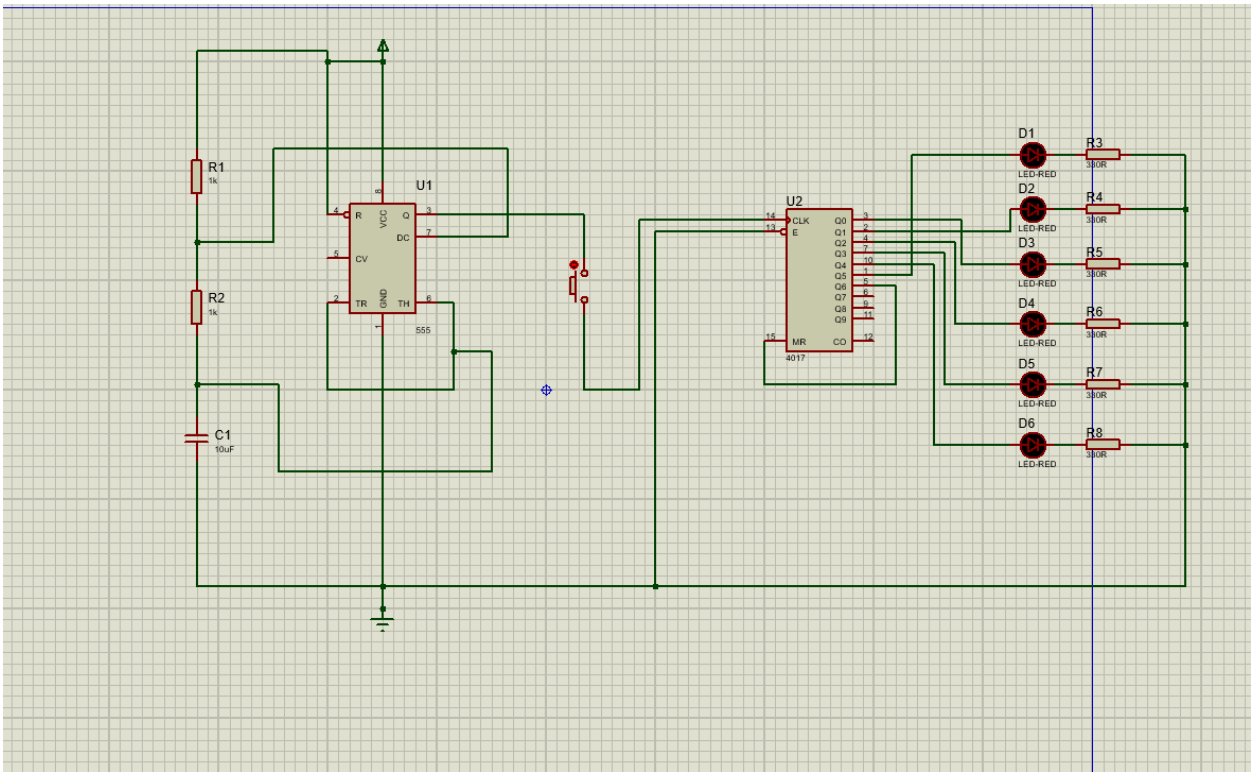
Battery:

To provide power.

Switch:

To push the clock and to generate output.

Circuit Diagram:



Implementation in Hard form:

The working of this circuit is very easy when we connect it with 9V battery the bulbs begin to glow and when we push the button it stops on a random number and only one bulb

glows after pushing the button. Place the LEDs, 2 1k ohm capacitors, 10 micro farad capacitor and both ICs on bread board.

Connections of 555 IC:

Place the IC on bread board. Connect pin 1 with ground. Short circuit pin 2 and 6. Connect pin 3 with one terminal of switch. Pin 4 to +VCC. Pin 6 with the junction between 1k resistor and capacitor. Pin 7 to the junction between both 1k resistors. Pin 8 to +VCC.

Pin Number	Functionality
1	It is grounded.
2	It is connected with pin 6 and 10 micro farad capacitor.
3	Connected with push button.
4	Connected with 1k resistors.
7	Connected with 1k resistors.
8	Also known as VCC. Connected with power.

Connections of 4017 IC:

Place the IC on bread board. Connect pin 16 to +VCC. Pin 8 and 13 to ground. Short circuit 5 and 15. Pin 14 to second terminal of switch.

Pin Number	Functionality
1	Connected with LED 1 to show output.
2	Connected with LED 2 to show output.
3	Connected with LED 3 to show output.
4	Connected with LED 4 to show output.
5	Connected with pin 15 reset pin.
7	Connected with LED 5 to show output.
10	Connected with LED 6 to show output.

13	Connected with E 1 and then grounded.
14	Connected with Clock.

Connections of LEDs:

Connect output LEDs with 4017 IC in this order. Connect cathode of LEDs to ground through 330 ohm current limiting resistors.

- Pin 1 with LED 1.
- Pin 2 with LED 2.
- Pin 3 with LED 3.
- Pin 4 with LED 4.
- Pin 7 with LED 5.
- Pin 10 with LED 6.

Connections of Capacitor:

Connect +ve terminal of capacitor with 1k resistors and -ve terminal to ground.

Improvements:

- **Use a microcontroller:**

Instead of using discrete ICs like the 555 timer and 4017 counter, you can employ a microcontroller like Arduino or Raspberry Pi. This allows for more flexibility, programmability, and expandability in terms of the dice function.

- **Add a display:**

Incorporate a digital display module such as a 7-segment display or an OLED display to show the number rolled. The microcontroller can control the display and update it based on the random number generated.