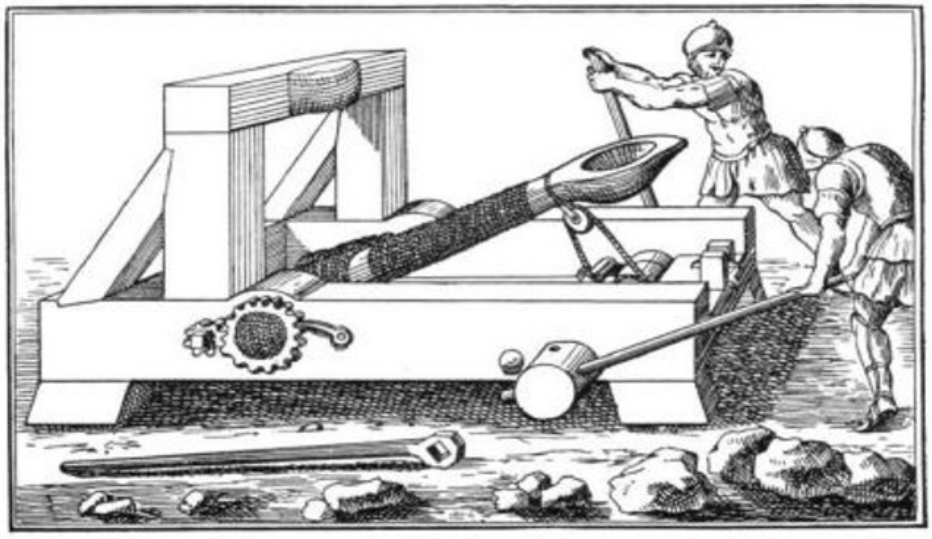
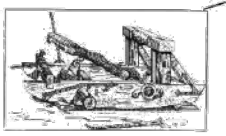
DEPARTMENT
OF
ELECTRONICS AND COMMUNICATION ENGINEERING

THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

Handout/Assignment-
for
Engineering Design Project-I (UTA013)



INSTRUCTOR INCHARGE



ASSIGNMENT –3(A)

Exercise 1 – To verify the functional table of CD4543

Hardware Required

- Decoder (CD4543)
- Seven Segment Display
- Single core connecting wires
- Tinkercad Software tool (https://www.tinkercad.com/)

Theory

The decoder (CD4543) is a combinational digital circuit that decodes an 4-bit binary input in the range 0000-1001 (BCD) in to its corresponding decimal level. Example for the binary value 0101 we need to display 5. Hence the decoder will output a HIGH on segments (a, c, d, f and g) with output a LOW on segments (b and e). The latch signal is normally connected to 5V via 10Kohm resistor as per the circuit diagram.This allows the decoder to decode the present binary input (the latch is said to be in a transparent state). When the latch is connected to 0V via the jumper provided its logic state changes to a LOW and the decoder will decode the binary input prior to the latch going low (i.e. the display is frozen when the latch is LOW).

Schematic Diagram

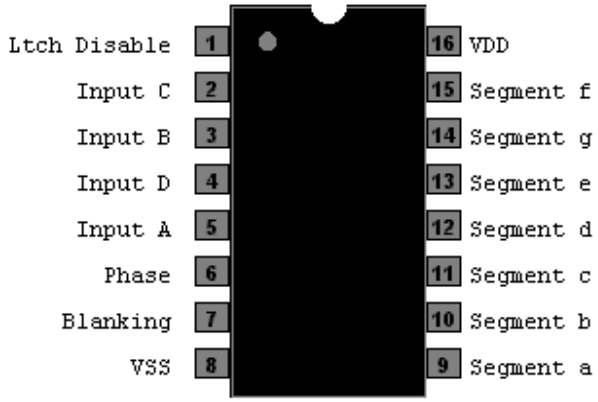
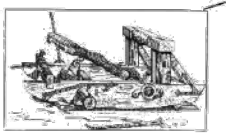


Figure 1: Pin diagram of CD4543

Truth table of CD4543B for Common Cathode Seven Segment Display.

LD	BL	PH	D	C	B	A	a	b	c	d	e	f	g	DISPLAY
1	0	0	0	0	0	0	1	1	1	1	1	1	0	0
1	0	0	0	0	0	1	0	1	1	0	0	0	0	1
1	0	0	0	0	1	0	1	1	0	1	1	0	1	2
1	0	0	0	0	1	1	1	1	1	1	0	0	1	3
1	0	0	0	1	0	0	0	1	1	0	0	1	1	4
1	0	0	0	1	0	1	1	0	1	1	0	1	1	5
1	0	0	0	1	1	0	1	0	1	1	1	1	1	6
1	0	0	0	1	1	1	1	1	1	0	0	0	0	7
1	0	0	1	0	0	0	1	1	1	1	1	1	1	8
1	0	0	1	0	0	1	1	1	1	1	0	1	1	9

Figure 2: Functional table of CD4543



ASSIGNMENT – 3(B)

Exercise 2 – BCD (binary coded decimal) to 7 Segment Display

Hardware Required

- Decoder (CD4543)
- Seven Segment Display
- Single core connecting wires
- Tinkercad Software tool (https://www.tinkercad.com/)
- Arduino Uno

Theory

The decoder (CD4543) is a combinational digital circuit that decodes an 4-bit binary input in the range 0000-1001 (BCD) in to its corresponding decimal level. Example for the binary value 0101 we need to display 5. Hence the decoder will output a HIGH on segments (a, c, d, f and g) with output a LOW on segments (b and e). The latch signal is normally connected to 5V via 10Kohm resistor as per the circuit diagram.
This allows the decoder to decode the present binary input (the latch is said to be in a transparent state). When the latch is connected to 0V via the jumper provided its logic state changes to a LOW and the decoder will decode the binary input prior to the latch going low (i.e. the display is frozen when the latch is LOW).

Schematic Diagram

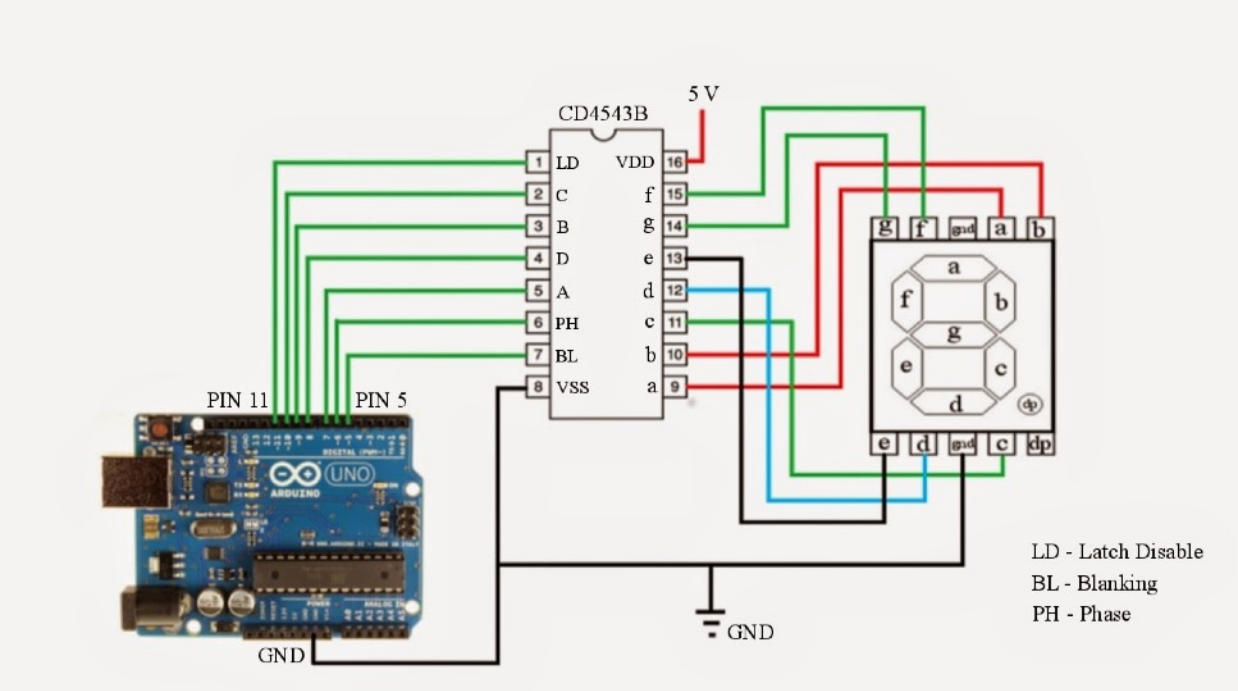
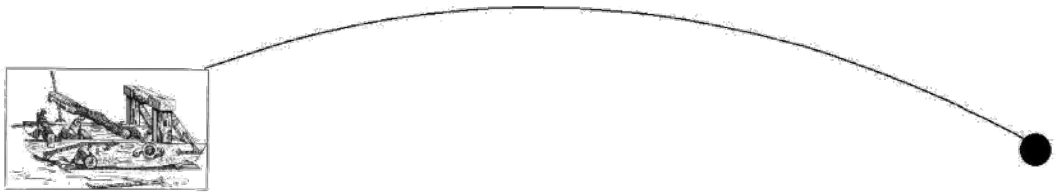
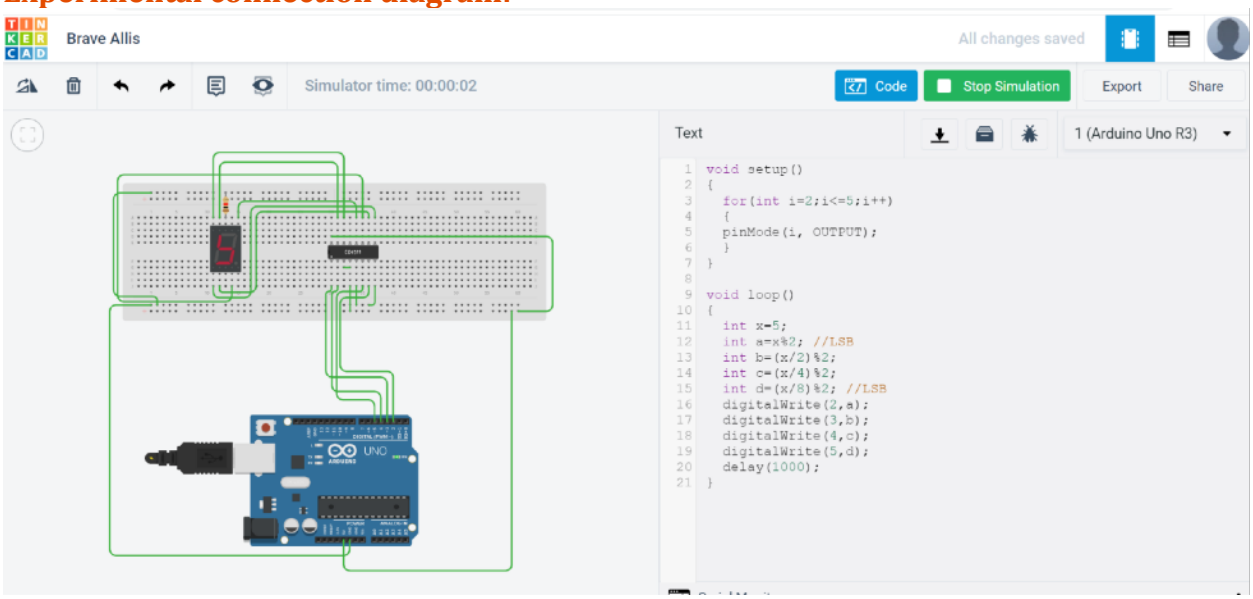
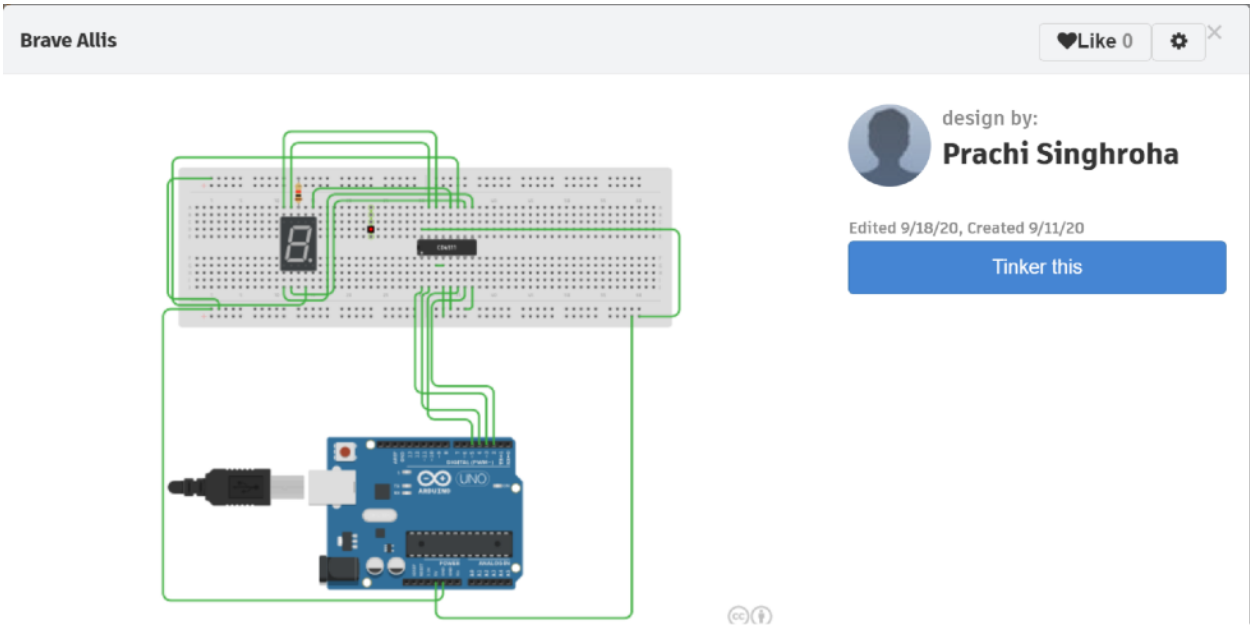


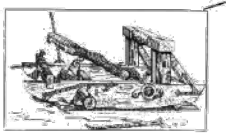
Figure 1: Connection setup for converting BCD input to seven segment ouput.



Experimental connection diagram:







Code:

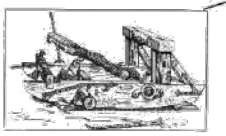
```
void setup()
{
  for(int i=2; i<=5; i++)
  pinMode(i, OUTPUT)
}
void loop()
{ int x=5;
  int P = x%2;
  int Q = (x/2)%2;
  int R = (x/4)%2;
  int S = (x/8)%2;

  digitalWrite(2,P);
  digitalWrite(3,Q);
  digitalWrite(4,R);
  digitalWrite(5,S);
  delay(1000);
}
```

Reflections:

Reflection

1. We learnt to display number on 7 segment display.
2. We can make 4-digit BCD of the particular digit to display that number.
3. We learnt the difference in common anode & cathode of 7 segment display.



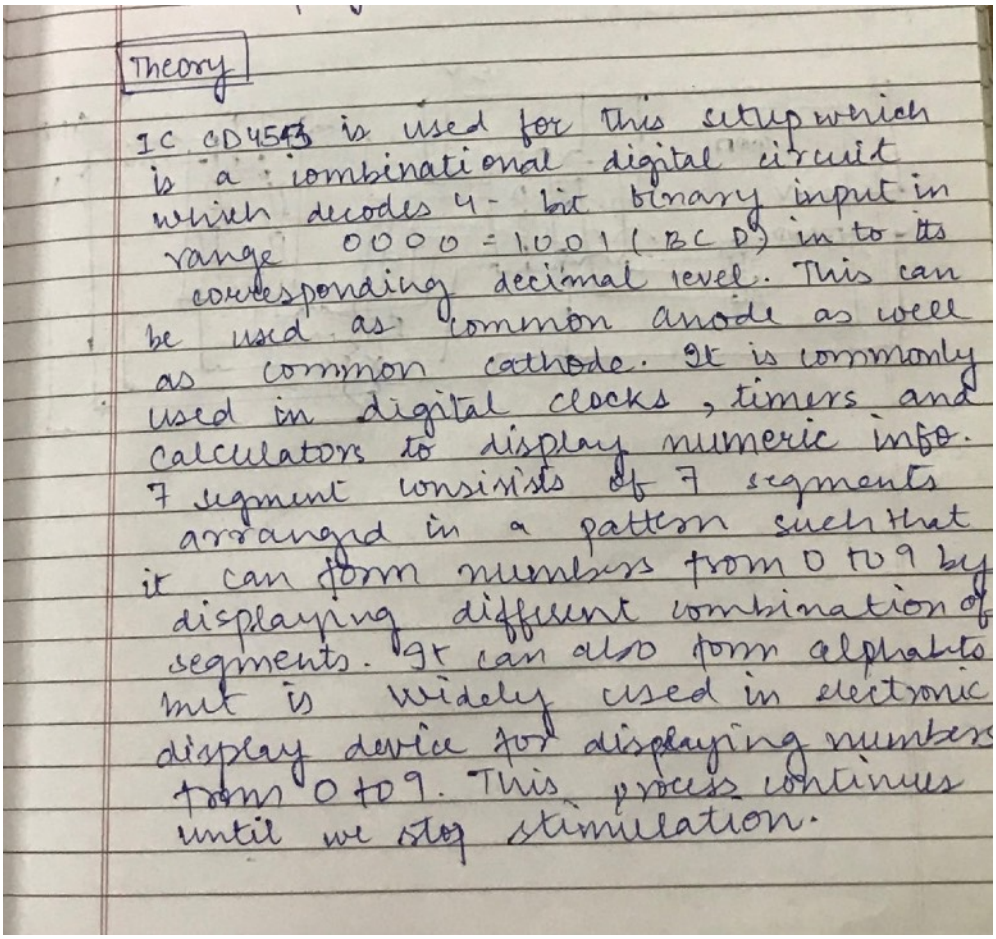
ASSIGNMENT – 3(C)

Exercise 3 –Write an Arduino sketch to make an up counter which counts from 0 to 9 & repeat it infinitely. Display the digits using BCD code on the 7-segment display on digital trainer kit.

Hardware Required

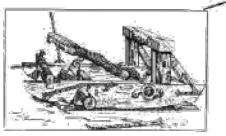
- Decoder (CD4543)
- Seven Segment Display
- Single core connecting wires
- Tinkercad Software tool (https://www.tinkercad.com/)
- Arduino Uno

Theory (Write the theory as per your understanding during self-effort and lab hours)

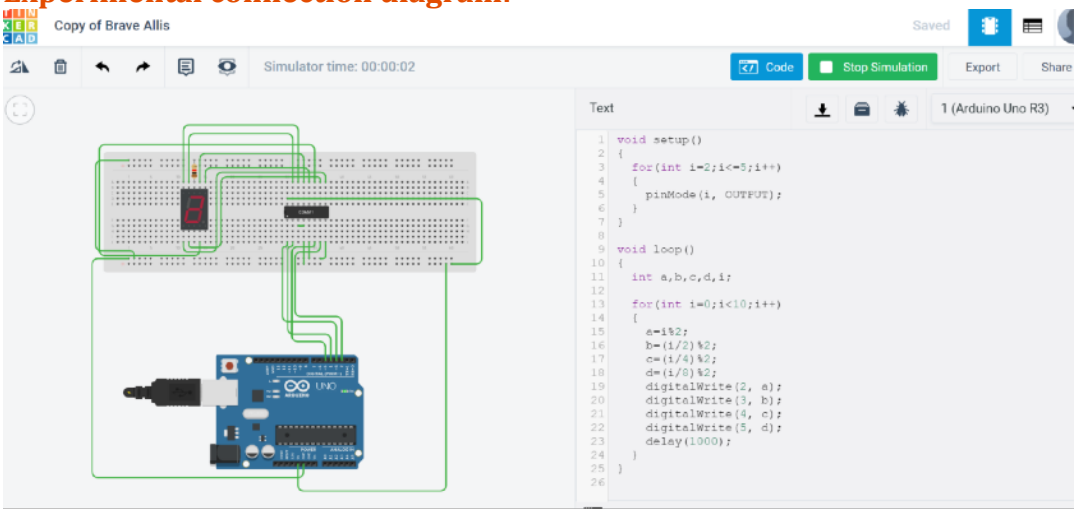


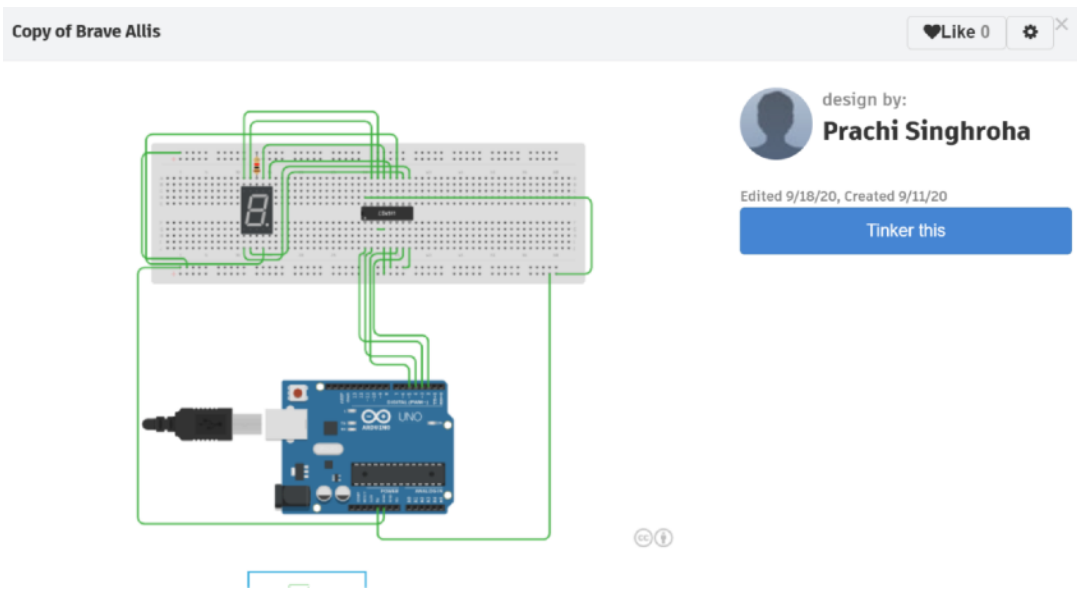
Theory

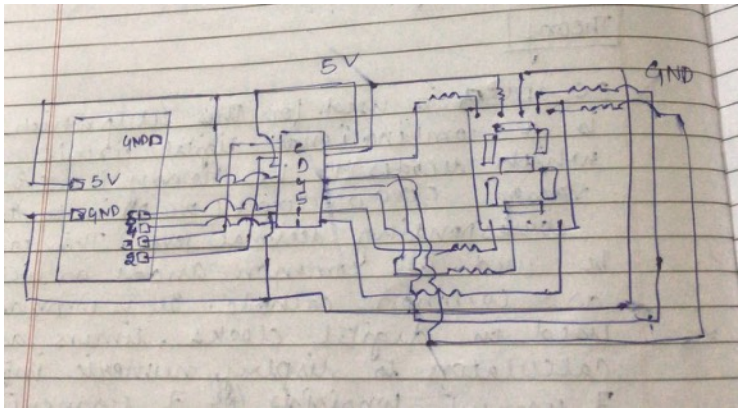
IC CD4543 is used for this setup which is a combinational digital circuit which decodes 4-bit binary input in range 0000 - 1001 (BCD) in to its corresponding decimal level. This can be used as common anode as well as common cathode. It is commonly used in digital clocks, timers and calculators to display numeric info. 7 segment consisists of 7 segments arranged in a pattern such that it can form numbers from 0 to 9 by displaying different combination of segments. It can also form alphabets but is widely used in electronic display device for displaying numbers from 0 to 9. This process continues until we stop stimulation.

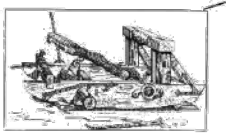


Experimental connection diagram:









Code:

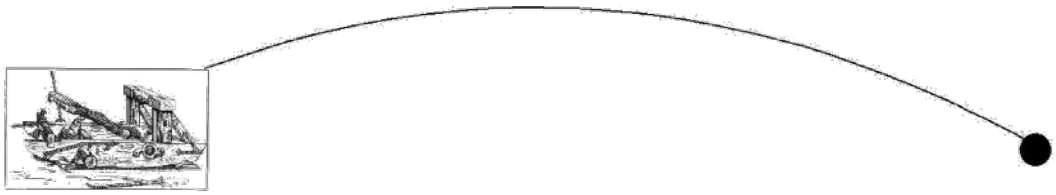
```
void setup ()
{
  pinMode (2, OUTPUT);
  pinMode (3, OUTPUT);
  pinMode (4, OUTPUT);
  pinMode (5, OUTPUT);
}
void loop ()
{
  int a, b, c, d, x;
  for (int i=0; i<10; i++)
  {
    x = i;
    a = x%2;
    b = (x/2)%2;
    c = (x/4)%2;
    d = (x/8)%2;

    digitalWrite (2, a);
    digitalWrite (3, b);
    digitalWrite (4, c);
    digitalWrite (5, d);

    delay (2000);
  }
}
```

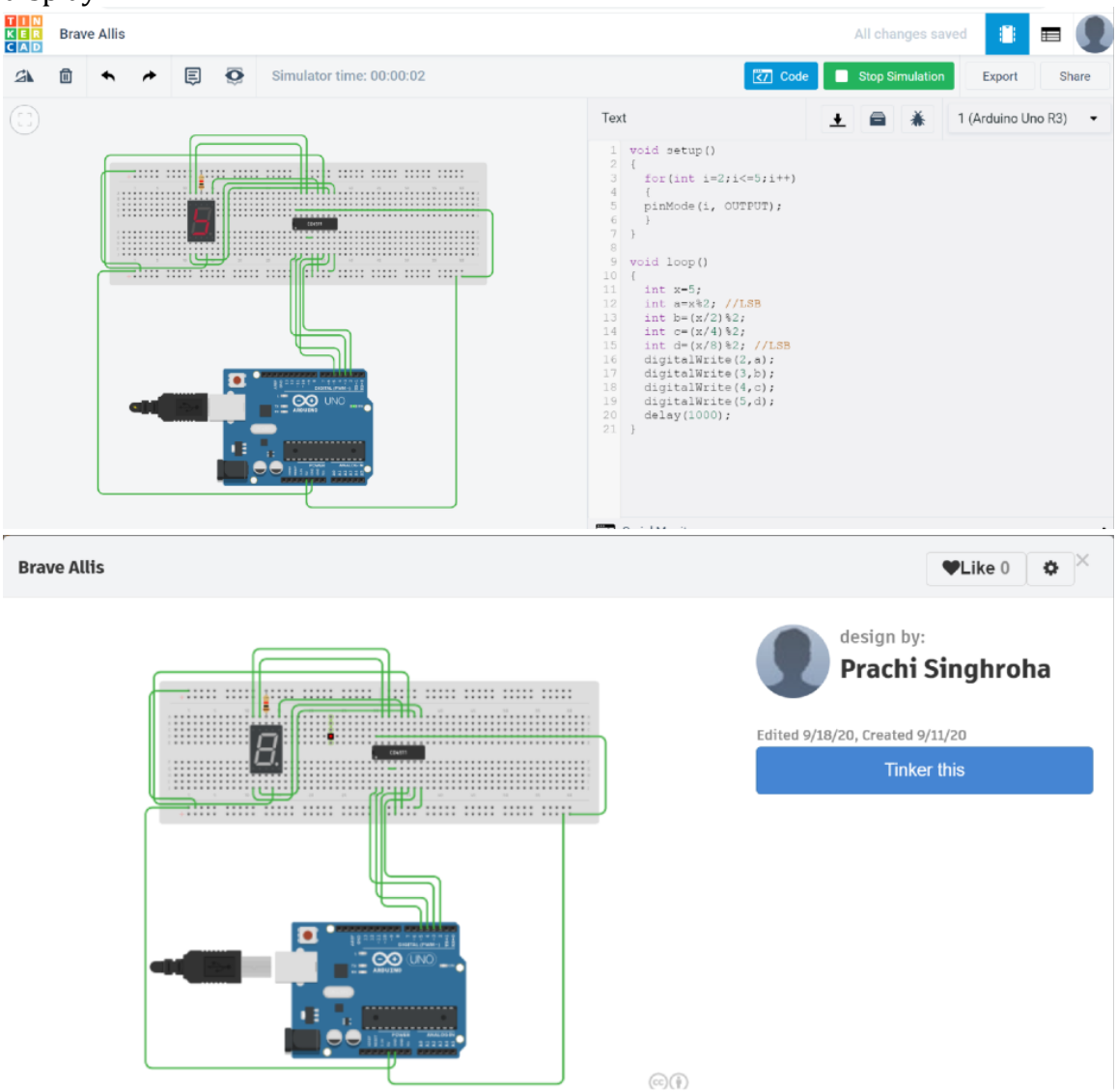
Reflections:

- We learnt the working of 7 segment display.
- It is possible to display any single digit number
- Learnt how to display number with 7-segment display & LED circuit.



Assignment Tasks:

- Redesign Exercise 2 and display the last digit of your Roll Number on the 7 segment display.



- Write an Arduino sketch to make an up counter which counts from 0 to 9 & repeat it infinitely using Tinkercad

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