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**LAB 6**  
**DIGITAL SYSTEMS AND MICROCONTROLLERS**

**AIM :**

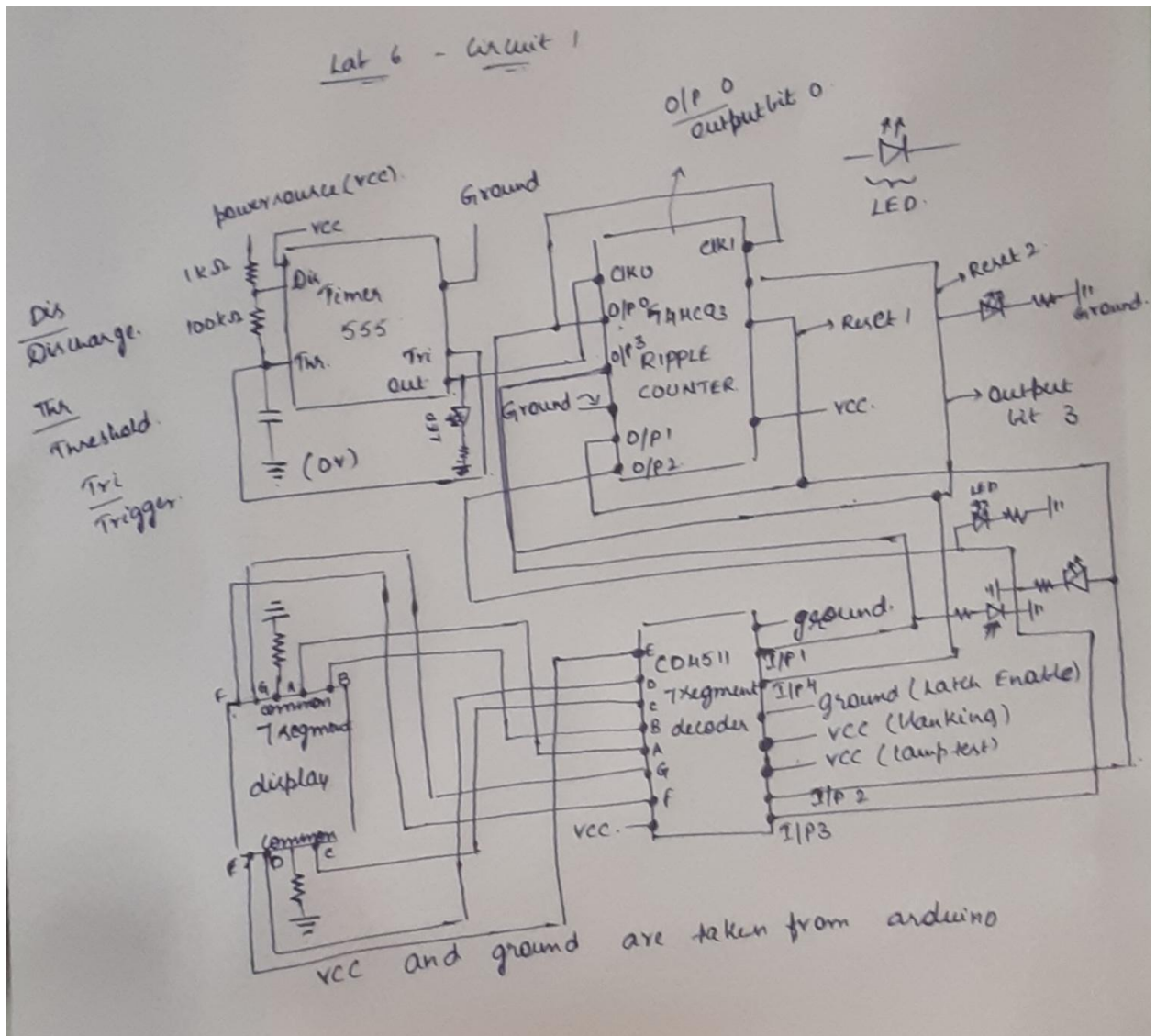
- 1) **Circuit 1 :** In this circuit we should generate a clock pulse using timer 555 and connect it to ripple counter . Using the outputs of the ripple counter we should display numbers 0 -9 on 7 segment display .
- 2) **Circuit 2A :** Using the shift register we should display 0 to 255 in order using 8 Leds .
- 3) **Circuit 2B :** Take the input (0-7) from the user so that corresponding led glows . Do this with a shift register .

**ELECTRONIC COMPONENTS :**

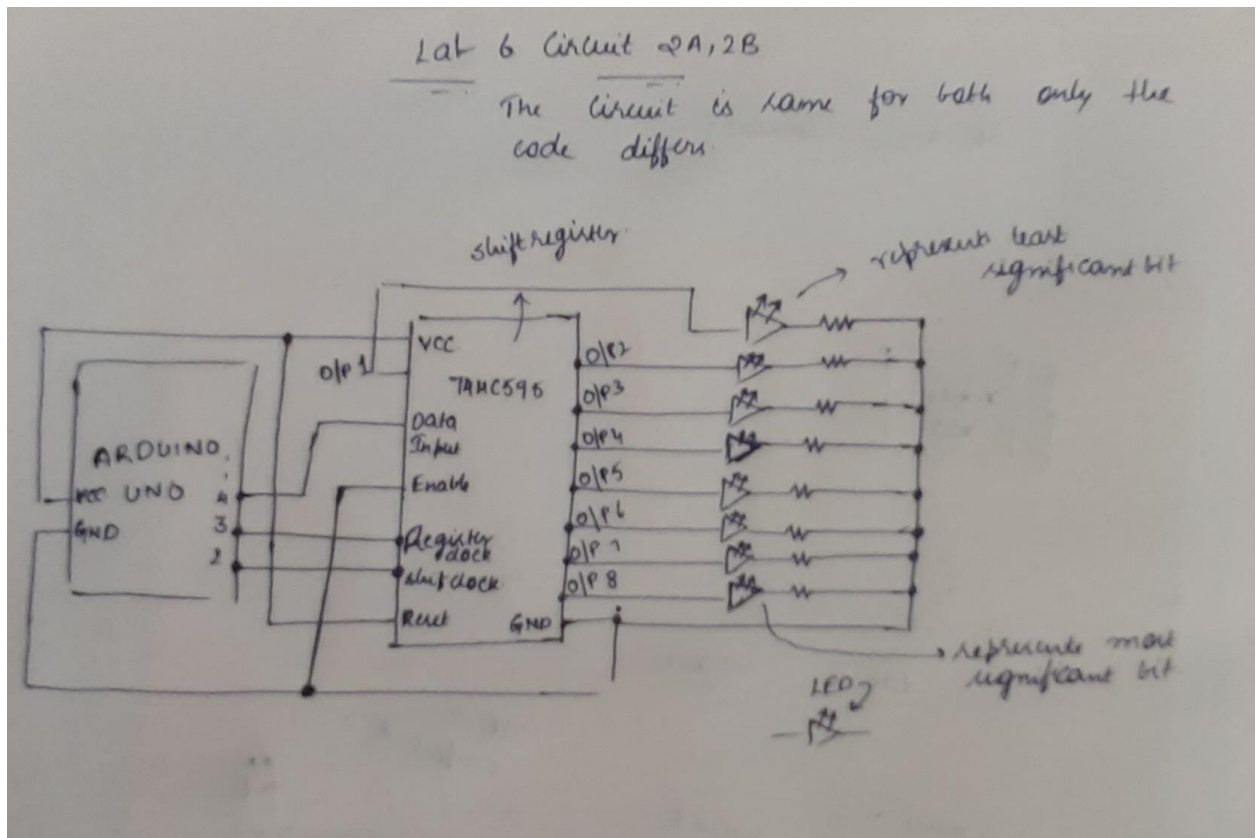
- 1) **Circuit 1 :**
  - Arduino ,BreadBoard , Led's , resistor
  - **TIMER 555 :** It is a a Integrated circuit(chip) which is used for timer , delay , pulse generation , oscillator applications . Here we use it for pulse generation which is fed into clock 0 of IC 74HC93
  - 7 segment decoder(IC CD4511)
  - 7 segment display
- 2) **Circuit 2A :**
  - Arduino , BreadBoard , Led's , resistor
  - IC 74HC595
- 3) **Circuit 2B :**
  - Arduino , BreadBoard , Led's , resistor
  - IC 74HC595

**REFERENCE CIRCUIT :**

# 1) Circuit 1 :



## 2) Circuit 2A and Circuit 2B :



### PROCEDURE :

#### 1) Circuit 1:

- We should generate a square pulse using timer 555 which we should feed into clock 0 of IC 74HC93 - Ripple counter .
- We should reset the ripple counter after 9 i.e at 10 so that it display the values 0 to 9 only using leds .
- We should connect the outputs of the ripple counter to 7 segment decoder.
- Then connect the outputs of the 7 segment decoder to the 7 segment display to display numbers 0 to 9 .

#### 2) Circuit 2A :

- Give the input ,Latch Input ,clock to shift register ( IC 74HC595) through arduino .
- Write a code to count from 0 to 255 and glow the corresponding 8 LED's in order .
- CODE :  

```
int dataInput = 2;
int latchPin = 5; // storage clock
int clock = 7; // shift clock
```

```

void setup()
{
  pinMode(dataInput,OUTPUT);
  pinMode(latchPin,OUTPUT);
  pinMode(clock,OUTPUT);
}
void loop()
{
  for(int i=0;i<255;i++)
  {
    digitalWrite(latchPin,LOW);
    shiftOut(dataInput,clock,MSBFIRST,i);
    digitalWrite(latchPin,HIGH);
    delay(150);//dealy for 150 milliseconds
  }
}

```

### 3) Circuit 2B :

- In this also give the data input, latch input , clock to the shift register (IC 74HC595) through arduino .
- Write the code for taking the any of the input's from 0 to 7 from the user such that the corresponding Led glow for corresponding input .
- CODE :

```

int dataInput = 2;
int latchPin = 5;//storage clock
int clock = 7;// shift clock
int Input;

void setup()
{
  pinMode(dataInput,OUTPUT);
  pinMode(latchPin,OUTPUT);
  pinMode(clock,OUTPUT);
  Serial.begin(9600);//sets the data rate to 9600 bps
}
void loop()
{
  digitalWrite(latchPin,LOW);
  Serial.print("INPUT:");
  while(Serial.available()==0){};
  Input = Serial.read();
  //Input = Serial.parseInt();//for numbers greater than 9
  //reads the input in form of int
  Input = Input - '0';
  Serial.println(Input);
}

```

```

if(Input>1)
{
    shiftOut(dataInput,clock,MSBFIRST,pow(2,Input)+1);
    digitalWrite(latchPin,HIGH);
}
else
{
    shiftOut(dataInput,clock,MSBFIRST,pow(2,Input));
    digitalWrite(latchPin,HIGH);
}
}

```

#### **OBSERVATION :**

##### **1) Circuit 1 :**

- The Leds glow to represent numbers 0 to 9 in order in binary form .After 9 it again comes back to 0 and the process repeated until stopped .
- The numbers 0 to 9 are displayed on 7 segment LED in order.After 9 it again comes back to 0 and process repeats until stopped.

##### **2) Circuit 2A :**

- The Leds glow to represent numbers 0 to 255 in order in binary form.After 255 it again comes back to 0 and the process is going to be repeated until stopped .

##### **3) Circuit 2B :**

- The user must input any number from 0 to 7 . Corresponding to the input the corresponding LED will be glowing .

#### **LINK TO THE TINKERCAD SIMULATION :**

##### **1) Circuit 1 :**

[https://www.tinkercad.com/things/8RahTjuROnm-lab-6-part-1/editel?sharecode=m2wRiT9iDjsJOnkx52\\_grHWCi4VMn3eWu4TYaP2fbeo](https://www.tinkercad.com/things/8RahTjuROnm-lab-6-part-1/editel?sharecode=m2wRiT9iDjsJOnkx52_grHWCi4VMn3eWu4TYaP2fbeo)

##### **2) Circuit 2A :**

<https://www.tinkercad.com/things/5Mu8qQXauPF-lab6-part-2a/editel?sharecode=Z0libIB5YSzRBOEmXXu6y8h6tuv4XXXIjVM2CXUPXAE>

##### **3) Circuit 2B :**

[https://www.tinkercad.com/things/dHWMj9dsDJY-lab6-part-2b/editel?sharecode=Uw97yGA5VzbaX0GmB2oQMa-QdkerlgHAA\\_PGEGmjxTc](https://www.tinkercad.com/things/dHWMj9dsDJY-lab6-part-2b/editel?sharecode=Uw97yGA5VzbaX0GmB2oQMa-QdkerlgHAA_PGEGmjxTc)