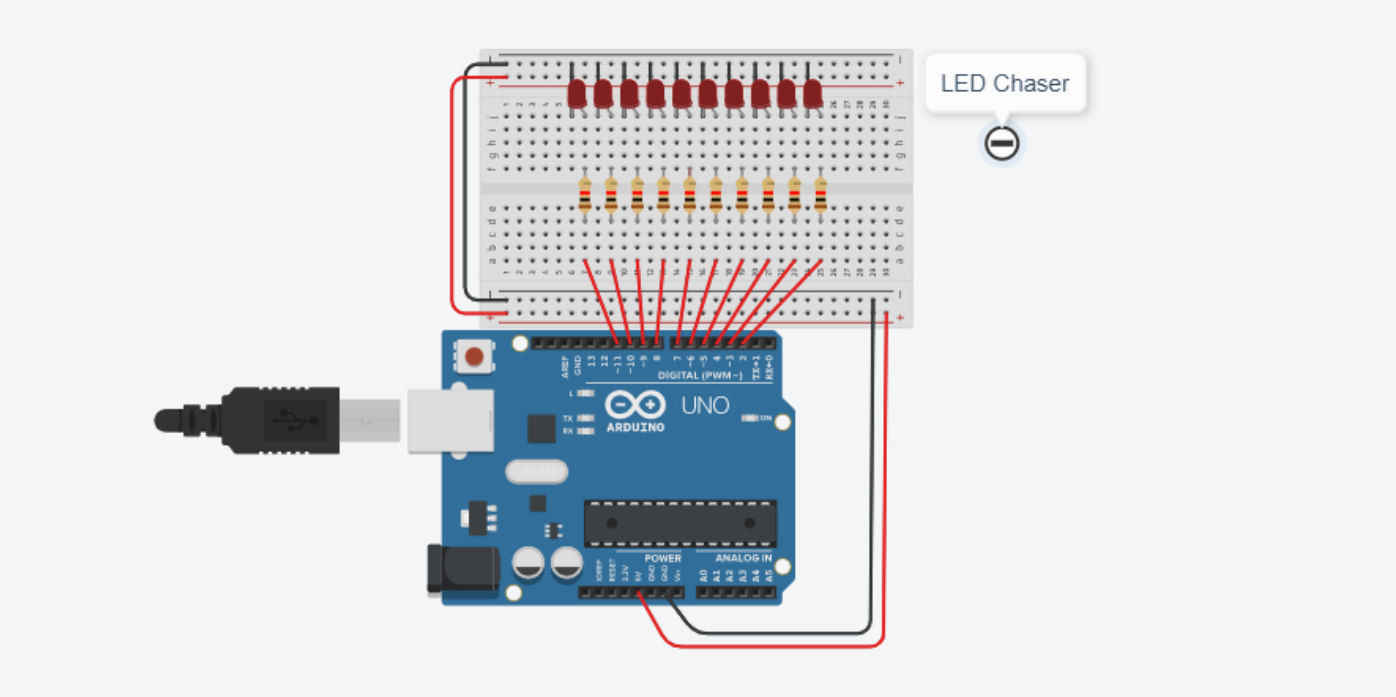
Experiment 1:- Design a LED Chaser

Circuit Diagram:-



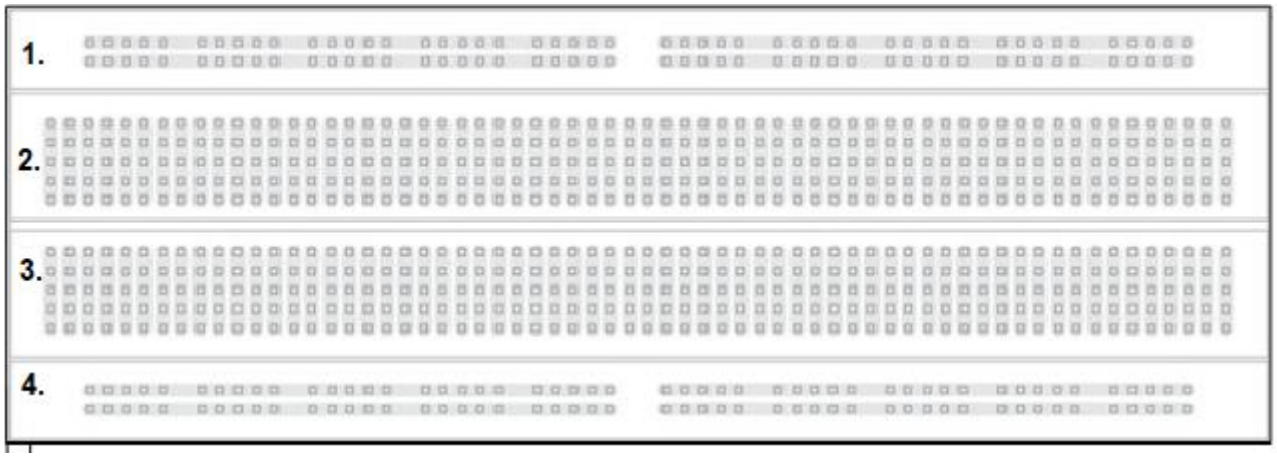
- Fig:1

Theory: -

Concept used:-

- The Arduino board can supply a power of 5V as digital output signals through the 14 pins (namely 0-13) present in it as digital input or output pins.
- The GND pin of the Arduino board acts as ground
- (It provide 0V).

- LEDs have polarity, which means they will only light up if you orient the legs properly that is the positive terminal of the LED should be connected to positive the terminal of the battery and negative terminal of the LED should be connected to the negative terminal of the battery.
- But in case of Arduino: The positive is connected to a digital pin on the Arduino board. The short leg goes to GND on the Arduino board.



- Fig:2

- This is a breadboard, sometimes known as a solderless breadboard. It has lots of holes that you can stick wires or electronic components into, and which are connected inside the breadboard. This lets you create a circuit containing multiple components without having to physically attach them to each other.
- Resistor provide resistance to the flow of current and make the equipment safe from current.

- Ohm’s Law : With the help of ohm’s law we can estimate the resistance required for LED’s because it provide us a relation between current, voltage and electricity i.e.

$$V=IR$$

$$\rightarrow R=V/I$$

- Due to Electromagnetic induction there is always some millivolts are introduce in the circuits so to make it a 0V pin connect it to a ground.

Learning and Observation: -

Learnings:

- Making a series and a parallel circuit using an Arduino board and a breadboard.
- LED’s are a diode and are biased.
- The long leg of LED is positive and the short leg is negative.
- How an Arduino works and how current flows through it.
- In breadboard there are 4 sections which are labeled in the above diagram as 1, 2, 3, and 4. In 1^{st} and 4^{th} section the holes are interconnected horizontally and both sections are independent of each other. And in 2^{nd} and 3^{rd} section the holes are interconnected vertically and both sections are independent of each other.
- Learned how to connect multiple LED’s with an Arduino board via breadboard
- In multiple LED’s all LED’s can have a common ground.
- Learned how to make different kind of patterns via Arduino.

Observations:-

- When we pass electrical signals to the Arduino via our code the LED blinks accordingly.
- By introducing delays we can make the blinking of led more interactive.
- LED’s first glow from Right to left than left to right.

Problem and Troubleshooting:-

- In order to protect the LED, to use a resistor "in series" with the LED. Make sure to use resistor of high resistance.
- If the LED doesn't light up, trying reversing the legs (you won't hurt the LED if you plug it in backward for a short period of time).
- The code was not uploading to the Arduino because of the wrong port selection. Make sure to choose the correct port just after connecting Arduino with the PC.
- Problem in compilation due to syntax error. So make sure to write the correct code
- Problem in sketching i.e. code uploading due to problem n Arduino IDE. If this problem is encountered start the IDE again.
- Some LED’s doesn’t glow because they are faulty. Replace them with new one.
- The pattern required is not forming so make sure to double check the code for any kind of logical errors.

Precautions:-

- The connections at different points should not be loose and the pins should be inserted properly.
- The two pins of the L.E.D should be connected at their appropriate point that is, the positive point should be connected with the Positive pin (digital pin) and the negative point should be connected with the negative pin (ground (GND)).
- Make sure the circuit is closed
- Make sure LED’s are not fused with the help of a multimeter.
- Make sure all LED’s are connected to different digital pins.
- Make sure all LED’s are connected to a common ground (GND).
- Double check the polarities of any connections you make.
- Keep a consistent wiring color code. Use red for power and black for ground.
- Calculate the expected current through all components before you apply power. Check the datasheet to make sure it's within safe limits.
- Connect and test one small part at a time, instead of in one big bang.
- Make sure the parts you buy expect the same voltage, or perform the appropriate conversion.

Learning Outcomes:-

- I have learned how to make circuits using an Arduino board and a breadboard and some other hardware.
- Through this experiment I have gained the skill of making a circuit using different hardware and controlling the functions done by that circuit with the help of codes.
- I have learned how to use multiple LED’s along with Arduino and breadboard.
- I have learned how to make patterns.
- I have learned how to use loops and arrays in physical computing.
- I have learned how we can use Arduino for prototyping.
- Through this experiment how to make different patterns with Arduino.
- I have learned how to use “TinkerCad” for simulation of Arduino board.