ESP report

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Theoretical Question

1. Write down a brief description of the Tensilica Xtensa LX6 Daul core microcontroller

> The Xtensa LX6 Dual core is a dual-core microcontroller, meaning it has two processing cores integrated into a single chip. This design enables it to handle multiple tasks simultaneously, enhancing the overall processing performance and efficiency.
> The microcontroller is built around the Xtensa LX6 architecture, which is known for its flexibility and scalability. It allows for easy customization and optimization of the processor core to meet specific performance, power, and area requirements of various applications.
> The LX6 cores are well-suited for a wide range of embedded applications, such as Internet of Things (IoT) devices, wearable gadgets, smart home automation, industrial automation, and other low-power, real-time processing applications. The dual-core configuration makes it ideal for running both application code and system-level tasks concurrently, optimizing resource utilization and ensuring responsive operation.

2. Compare micro-controllers to micro-processors with at least 5 different comparisons, is ESP32 a micro-processor and why/why not?

POD	Micro-controllers	Micro-processors
Definition	is controlling device where the memory and I/O output are present internally	is processing device where the memory and I/O output are present externally
Circuit complexity	Microcontrollers are present on chip memory. The circuit is less complex	The circuit is complex due to external connection
Applications	They are commonly used in embedded systems, IoT devices, consumer electronics, and other applications	They are prevalent in general-purpose computing devices like PCs, laptops, servers, smartphones, and other systems that require high computational capabilities.
Processing Power	They're have lower processing power compared to microprocessors. They are designed for simpler and resource-constrained applications.	Microprocessors are more powerful and can handle complex tasks and high-performance computations, making them suitable for applications requiring more processing horsepower.
Integration and peripherals	Typically come with a wide range of integrated peripherals like ADCs, DACs, UART, SPI, I2C, timers, PWM, etc.	Lack integrated peripherals and require external components to handle input/output tasks.

- The ESP32 is considered a microcontroller. It features a dual-core Xtensa LX6 microcontroller processor (32-bit), which includes integrated RAM, Flash memory, and a wide range of peripherals such as GPIO, UART, SPI, I2C, ADC, and more. The ESP32 is widely used in IoT applications, wearables, home automation, and other embedded systems where its combination of processing power, low-power capabilities, and integrated peripherals makes it a suitable choice.

3. Compare digital signals to analog signal with at least 5 different comparisons.

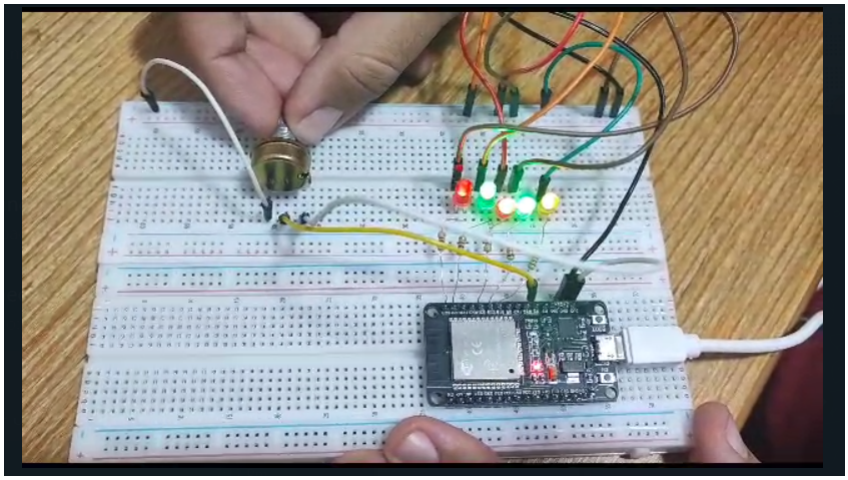
POD	Digital	Analog
Definition	Represent data using discrete binary values	Represent data using continuously varying voltage levels, allowing for a smooth and continuous representation of information.
Noise Immunity	More immune to noise and interference since they rely on discrete voltage levels.	Prone to noise interference, which can alter the amplitude or frequency of the signal, leading to inaccuracies in the transmitted information.
Examples	Computers, CDs, DVDs are some	Temperature sensors, FM radio signals, Photocells, Light sensor, Resistive touch screen.
Bandwidth Efficiency	Require less frequency spectrum due to discrete voltage levels, making them more bandwidth-efficient.	Need a wider frequency range due to continuous voltage variations, making them less bandwidth-efficient.
Power consumption	use less power for data transmission	use more power for data transmission.

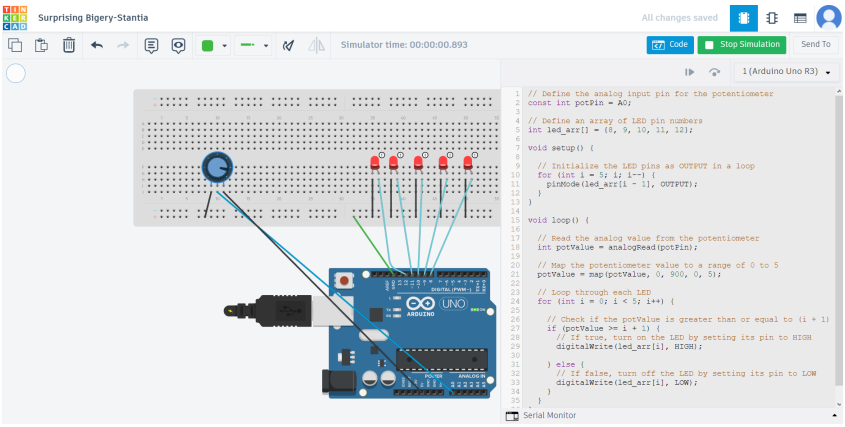
Problem 1

components:

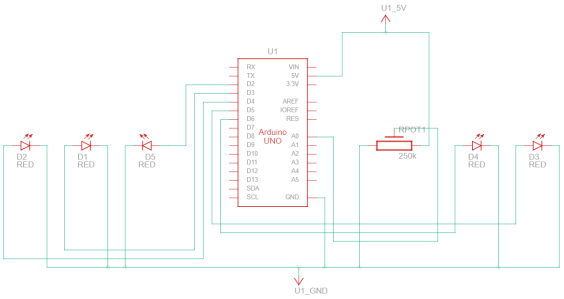
- 5 leds
- 9 Male Male jumper
- potentiometer
- 5 resistor

Circuit:
We connected each 5 pins with 5 leds and each led has jumper to the ground
connect potentiometer ground leg - +ve leg with 3v3 - output with pin 4
we map the potentiometer read to 6 which consist of each led and non of the leds





schema:

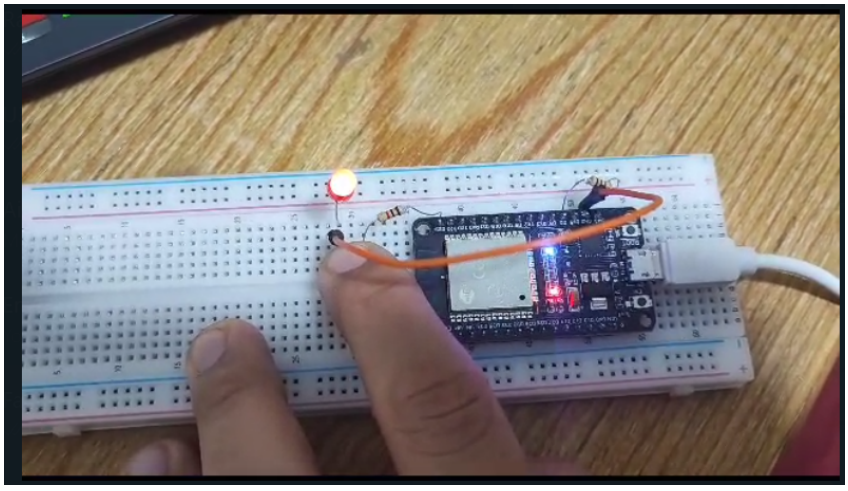


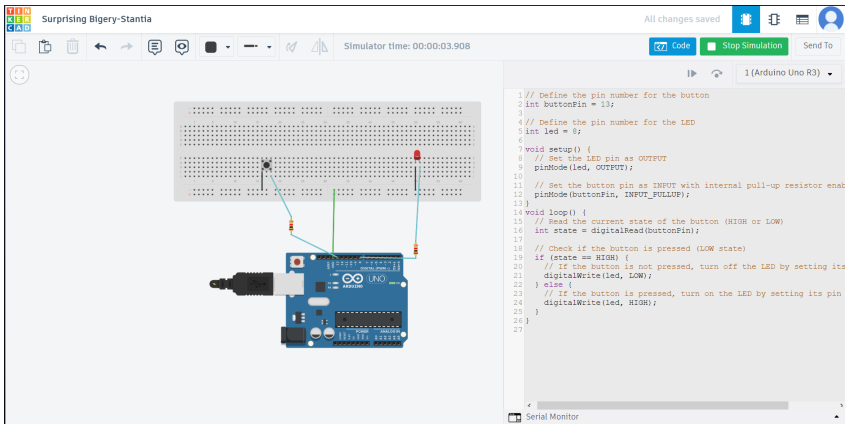
Problem 2

components:

- 1 led
- 1 Male Male jumper
- push button
- 2 resistor

Circuit:
We connected push button with pin no. 23 with resistor and another one with ground to make the pull up method also connected the led with ground and pin no. 2





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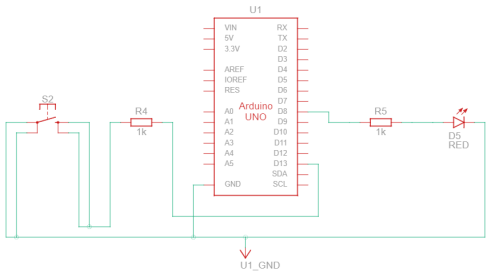


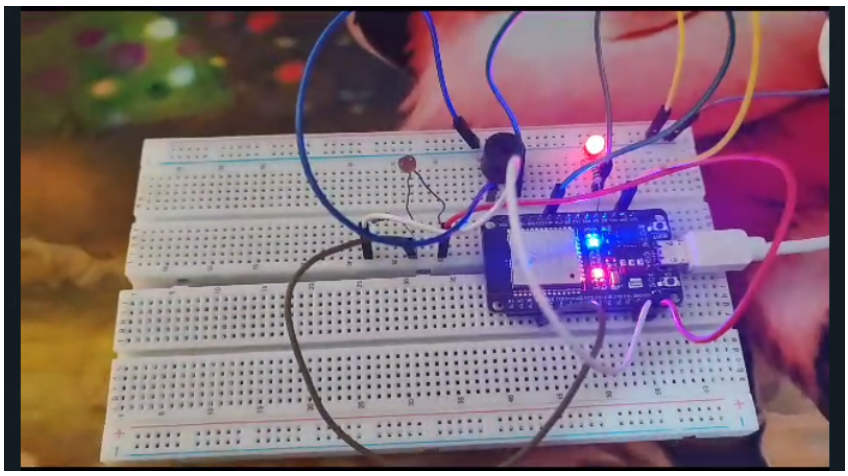
Problem 3

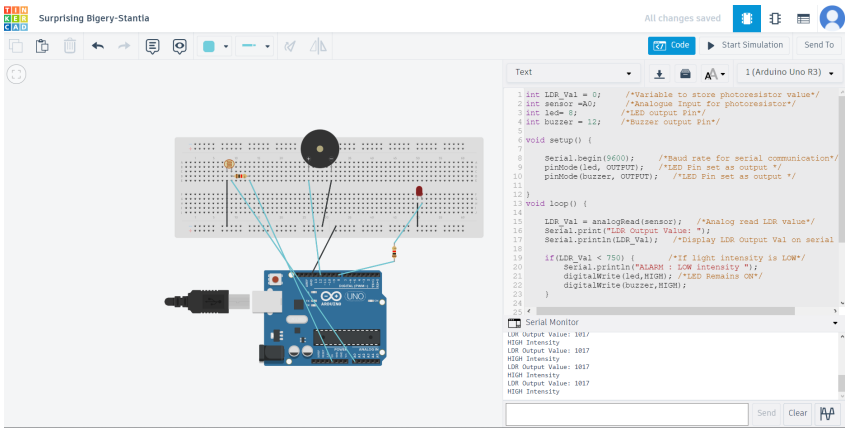
components:

- 1 led
- 7 Male Male jumper
- Buzzer
- LDR
- 2 resistors

connect the resistor and ground with led
connected +ve pin of buzzer with no 19 pin and -ve with gnd
connected LDR with no 34 pin and with gnd

Circuit:
when ldr find there's no light it'll buzzer and turn on alarm led ligh





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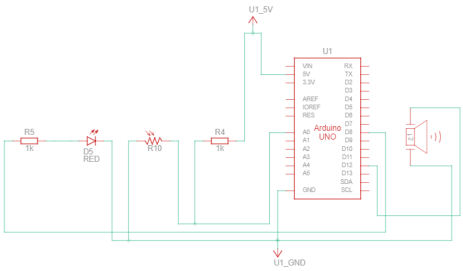


Bouns

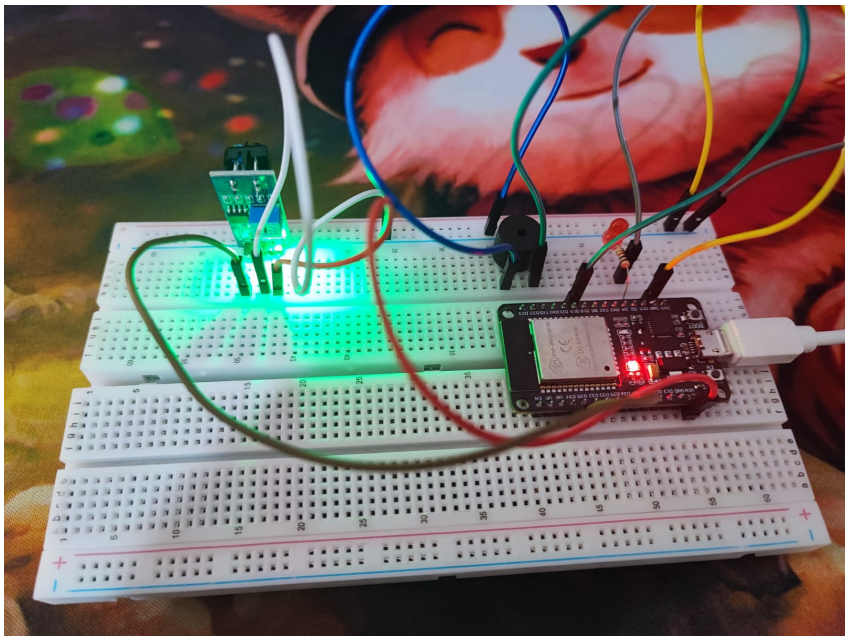
Q1

components:

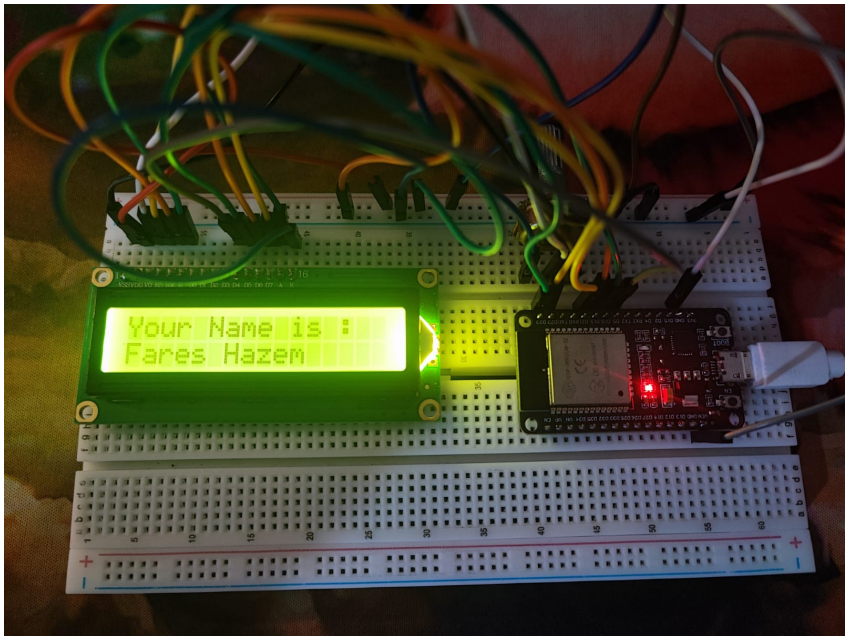
- 1 led
- 7 Male Male jumper
- Buzzer
- IR
- 1 resistor

connect the resistor and ground with led
connected +ve pin of buzzer with no 19 pin and -ve with gnd
connected IR with no 34 pin for output , +ve with vin and -ve with gnd

Circuit:
when IR find there's object in front of it it'll buzzer and turn on alarm led light



Q2



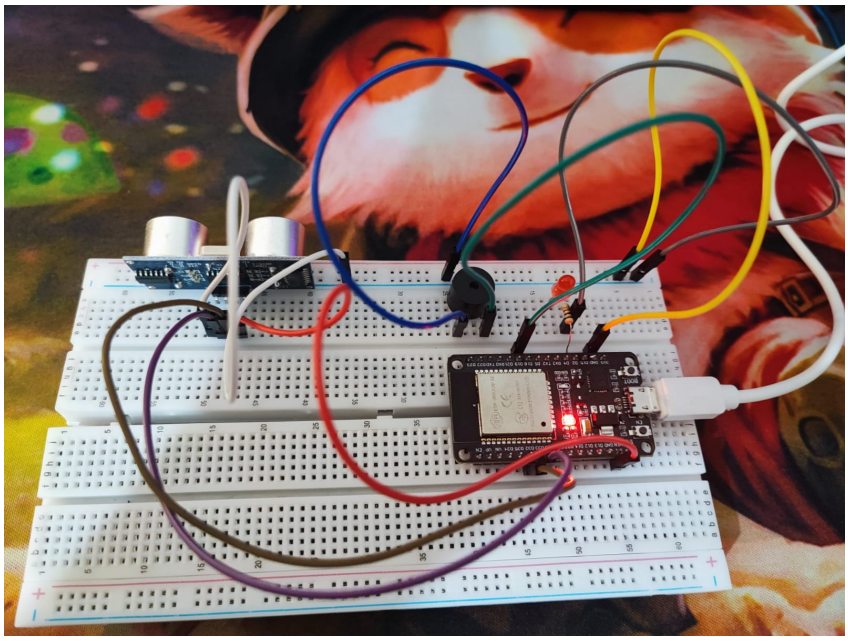
Q3

components:

- 1 led
- 7 Male Male jumper
- Buzzer
- Ultra sonic
- 1 resistor

connect the resistor and ground with led
connected +ve pin of buzzer with no 19 pin and -ve with gnd
connected Ultrasonic with no 34 pin for output , +ve with vin and -ve with gnd

Circuit:
when specific distance of object infront of ultra sonic it'll buzzer and turn on alarm led light



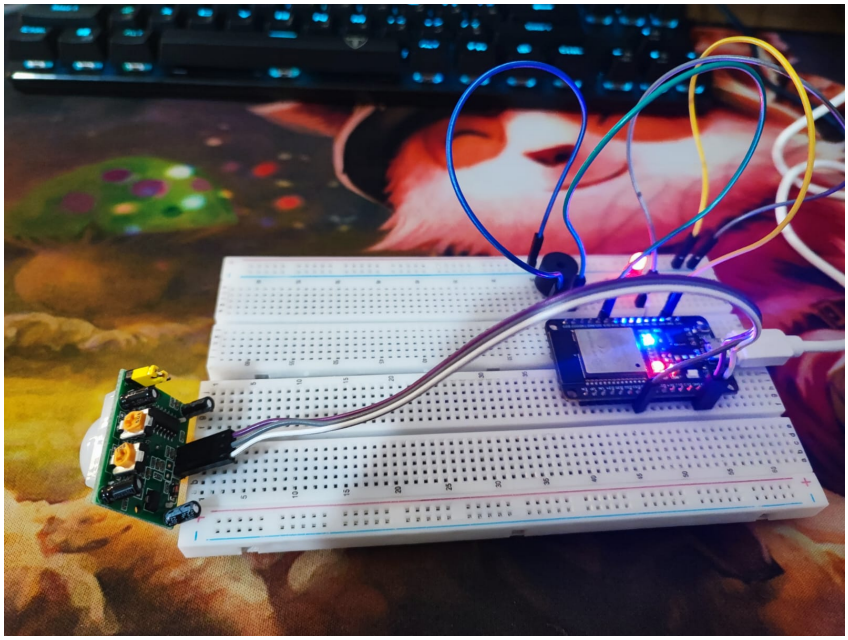
Q4

components:

- 1 led
- 7 Male Male jumper
- Buzzer
- IPR
- 1 resistor

connect the resistor and ground with led
connected +ve pin of buzzer with no 19 pin and -ve with gnd
connected PIR with no 33 pin for output , +ve with vin and -ve with gnd

Circuit:
when object moves in front of PIR it'll buzzer and turn on alarm led light.



Q5

components:

- 1 led
- 7 Male Male jumper
- Buzzer
- Flame sensor
- 1 resistor

connect the resistor and ground with led
connected +ve pin of buzzer with no 22 pin and -ve with gnd
connected Flame sensor with no 13 pin for output , +ve with vin and -ve with gnd

Circuit:
when Flame sensor detect flames of fire around it, it'll buzzer and turn on alarm led light.