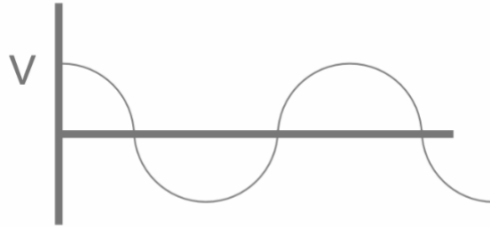


Multiple Choice

Which of the following is true about Direct Current?

1. Current flows in one direction then another
2. Current flows steadily in one direction



- 3.
4. Wall current does this by alternating 60 times per second
5. Direct current poses no risk of electric shock or fire hazards

Answer: 2

Direct current is characterized by the flow of electric charge in one direction without reversing its direction. In a DC circuit, current flows from negative to positive without alternating so it remains consistent in direction.

Which of the following best describes an amplifier?

1. A device used to decrease the strength of an electrical signal
2. A device used to convert electrical signals into mechanical energy
3. A device used to increase the strength or power of an electrical signal
4. A device used to store electrical energy for later use
5. A device used to show if a circuit has strong or weak signals

Answer: 3

Amplifiers are used in electronics to boost weak signals and improve signal and noise ratios. When an electric signal is fed into an amplifier, it increases the power of signal.

Which of the following statements best describes the function of a logic probe?

1. It measures the voltage levels in analog circuits
2. It makes signals to test digital circuits
3. It checks if communication cables are working
4. It shows if a digital circuit has strong or weak signals
5. It measures how often radio signal change

Answer: 4

This is a tool used for troubleshooting circuits. It connects to power and ground and when the probe tip makes contact to certain point in circuit, you can see if the signal is high or low.

Which of the following is not a property of solid wire?

1. Tends to hold shape after bending
2. Easier to insert in holes
3. Stiffer than stranded wire

4. Consists of a single and continuous piece of metal
5. More flexible than stranded wire

Answer: 5

Stranded wire is made up of multiple smaller strands whereas solid wire is made up of a single, continuous piece of metal which allows stranded wire to bend and flex more easily.

Which of the following is not an actuator?

1. Vibration motors
2. Stepper motors
3. Thermocouples
4. Solenoids
5. Liquid and air pumps

Answer: 3

An actuator is a device responsible for moving and controlling a system. A thermocouple is a temperature sensor that does not produce a physical motion or control.

Long Answer

Explain voltage, current and resistance using a water analogy. Draw a diagram.

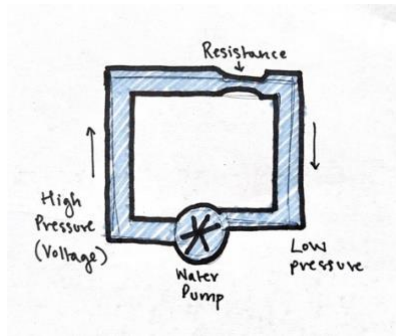
Answer:

Imagine pipes filled with water.

Voltage: Voltage is the pressure of the water in the pipes. Just like the water flows from an area of high pressure to low pressure, electric current flows from areas of high to low voltage. Voltage represents the force that drives electric current through a circuit. Higher water pressure makes water flow faster, so higher voltage makes electric current flow faster through a circuit.

Current: Current is like the amount of water in the pipes. It is how much water is moving past a point at a certain time. If you measure how much water is passing through per second, you are measuring the current. In an electric circuit, current is the flow of electric charge. If there is more current, there is more electric charge flowing. In order for current to flow, there needs to be a place for the electrons to go which means there needs to be a complete return path back to the power source.

Resistance: Resistance is the obstruction in the pipes that makes it harder for the water to flow through. In an electric circuit, resistance is what hinders the flow of electric current. If there is a higher resistance, less current can flow and lower resistance means more current can flow easily. To conclude, voltage is the measure of difference in electric potential. Current is the measure of the flow of charge from one point to another through a given point. Resistance is a measure of how difficult it is to push current through a circuit.



What is a micro-controller and what are its properties? List its key components and explain what each part does.

Answer:

Microcontroller is a small, self-contained computer that is designed to execute specific tasks and functions. Microcontrollers are used in various electric devices and appliances from consumer electronic to more complex industrial machinery.

Like most computers, it has:

Memory – have a built-in memory to hold both programs and data

Central processing unit (CPU) – a core component that is responsible for executing instructions and performing calculations like math, logic, and program flow. It processes data and controls operations.

I/O capabilities – These ports allow the microcontroller to communicate with external devices and sensors, they can read inputs and provide outputs.

Properties:

Small and simple devices – most typically 8-bit ALUs but recently seeing more 32-bit parts that offer greater processing power.

Inexpensive with minimal required external components

Optimized for low power operation – this makes them suitable for battery powered devices and IoT devices.

Minimal memory – 64 bytes of RAM

Don't support very dynamic loading of programs – some are only programmable one time, most modern ones use flash memory where you can reprogram and update.

Most use Harvard architecture – separate memories for program and data which helps improve performance and efficiency.

Usually contain specialized/ dedicated hardware to support control tasks.

Overall, microcontrollers offer a versatile and cost-effective solution for a variety of applications that require embedded computing and control functionalities.