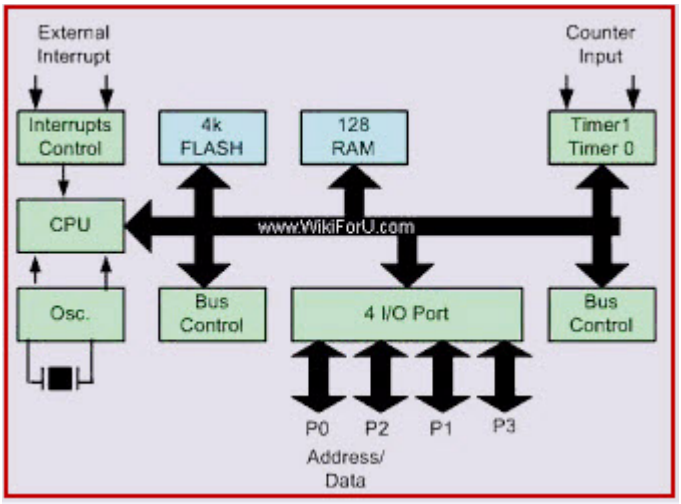
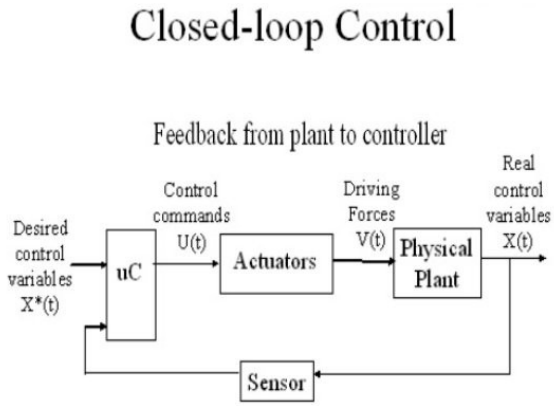
**Explain about 8051 and basics of control systems.**




The Intel MCS-51 (commonly termed 8051) is an internally Harvard architecture, complex instruction set computer (CISC) instruction set, single chip microcontroller (µC) series developed by Intel in 1980 for use in embedded systems.[1] Intel's original versions were popular in the 1980s and early 1990s and enhanced binary compatible derivatives remain popular today.



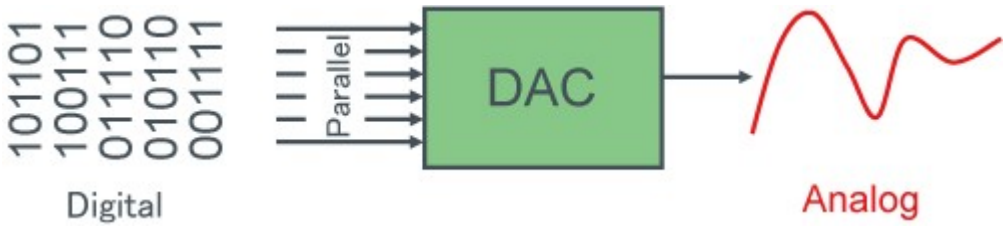

A control system manages, commands, directs, or regulates the behaviour of other devices or systems using control loops. It can range from a single home heating controller using a thermostat controlling a domestic boiler to large Industrial control systems which are used for controlling processes or machines.

https://en.wikipedia.org/wiki/Control_system

**Basics of AD-DA converter.**

D/A Converters

D/A converters convert digital signals into analog format.




Digital Data:

- Evenly spaced discontinuous values
- Temporally discrete, quantitatively discrete

Analog Data (Natural Phenomena):

- Continuous range of values
- Temporally continuous, quantitatively continuous

A/D Converters

An A/D converter is a device that converts analog signals (usually voltage) obtained from environmental (physical) phenomena into digital format

Conversion involves a series of steps, including sampling, quantization, and coding.

http://www.rohm.com/web/in/electronics-basics/ad-da-converters/what-are-ad-da-converters/

**What is protocol?**

All communications between devices require that the devices agree on the format of the data. The set of rules defining a format is called a *protocol*. At the very least, a communications protocol must define the following:

- rate of transmission (in baud or bps)
- whether transmission is to be *synchronous* or *asynchronous*
- whether data is to be transmitted in *half-duplex* or *full-duplex* mode

https://www.webopedia.com/TERM/C/communications_protocol.html

**Explain SPI , CAN.**

**SPI**

The Serial Peripheral Interface bus (SPI) is a synchronous serial communication interface specification used for short distance communication, primarily in embedded systems. The interface was developed by Motorola in the mid 1980s and has become a de facto standard. Typical applications include Secure Digital cards and liquid crystal displays.

SPI devices communicate in full duplex mode using a master-slave architecture with a single master. The master device originates the frame for reading and writing. Multiple slave devices are supported through selection with individual slave select (SS) lines.

Sometimes SPI is called a four-wire serial bus, contrasting with three-, two-, and one-wire serial buses. The SPI may be accurately described as a synchronous serial interface,[1] but it is different from the Synchronous Serial Interface (SSI) protocol, which is also a four-wire synchronous serial communication protocol. SSI Protocol employs differential signaling and provides only a single simplex communication channel.

https://en.wikipedia.org/wiki/Serial_Peripheral_Interface_Bus

**CAN**

A Controller Area Network (CAN bus) is a robust vehicle bus standard designed to allow microcontrollers and devices to communicate with each other in applications without a host computer. It is a message-based protocol, designed originally for multiplex electrical wiring within automobiles to save on copper, but is also used in many other contexts.

https://en.wikipedia.org/wiki/CAN_bus

**Explain UART.**

A universal asynchronous receiver-transmitter (UART /ˈjuːɑːrt/) is a computer hardware device for asynchronous serial communication in which the data format and transmission speeds are configurable. The electric signaling levels and methods are handled by a driver circuit external to the UART. A UART is usually an individual (or part of an) integrated circuit (IC) used for serial communications over a computer or peripheral device serial port. UARTs are now commonly included in microcontrollers. A related device, the universal synchronous and asynchronous receiver-transmitter (USART) also supports synchronous operation.

https://en.wikipedia.org/wiki/Universal_asynchronous_receiver-transmitter

**What are interrupts?**

In system programming, an interrupt is a signal to the processor emitted by hardware or software indicating an event that needs immediate attention. An interrupt alerts the processor to a high-priority condition requiring the interruption of the current code the processor is executing. The processor responds by suspending its current activities, saving its state, and executing a function called an interrupt handler (or an interrupt service routine, ISR) to deal with the event. This interruption is temporary, and, after the interrupt handler finishes, the processor resumes normal activities.[1] There are two types of interrupts: hardware interrupts and software interrupts.

https://en.wikipedia.org/wiki/Interrupt

**What in an interrupt service routine?**

In computer systems programming, an interrupt handler, also known as an interrupt service routine or ISR, is a special block of code associated with a specific interrupt condition. Interrupt handlers are initiated by hardware interrupts, software interrupt instructions, or software exceptions, and are used for implementing device drivers or transitions between protected modes of operation, such as system calls.

https://en.wikipedia.org/wiki/Interrupt_handler

**Explain ISR.**

An interrupt handler, also known as an interrupt service routine (ISR), is a callback subroutine in an operating system or device driver whose execution is triggered by the reception of an interrupt

Step in executing an Interrupt:

1) It finish the instruction it is executing and saves the address of the next instruction (PC) on the stack.

2) It also saves the current status of all the interrupt internally.

3) It Jumps to a fixed location in memory called the interrupt vector table that holds the address of the interrupt service routine.

4) The microcontroller gets the address of the ISR from the interrupt vector and jumps to it. It starts to execute the interrupt service subroutine until it reaches the last instruction of the subroutine.

5) Upon executing the RETI instruction ,the microcontroller returns to the Place where it was interrupt.

https://www.careercup.com/question?id=7988664

**What is the input Impedance of transistors?**

http://www.electronics-tutorials.ws/amplifier/input-impedance-of-an-amplifier.html

**What is drift velocity?**

The drift velocity is the average velocity that a particle, such as an electron, attains in a material due to an electric field. It can also be referred to as axial drift velocity. In general, an electron will propagate randomly in a conductor at the Fermi velocity.

**Explain Reactance.**

In electrical and electronic systems, reactance is the opposition of a circuit element to a change in current or voltage, due to that element's inductance or capacitance. The notion of reactance is similar to electrical resistance, but it differs in several respects.

**Explain RMS values calculations.**

Peak values can be calculated from RMS values from the above formula, which implies VP = VRMS × √2, assuming the source is a pure sine wave

https://en.wikipedia.org/wiki/Root_mean_square

**Explain Op-Amp classifications (types).**

Op-amps may be classified by their construction:

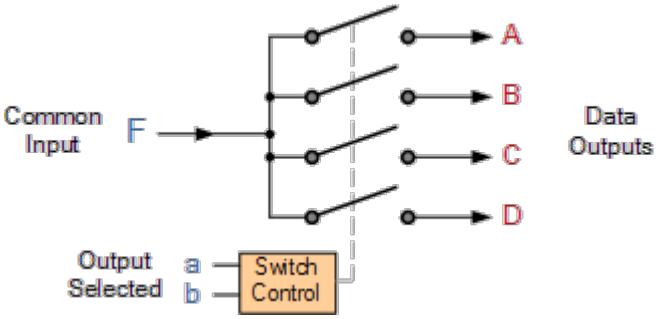
- discrete (built from individual transistors or tubes/valves)
- IC (fabricated in an Integrated circuit) — most common
- hybrid

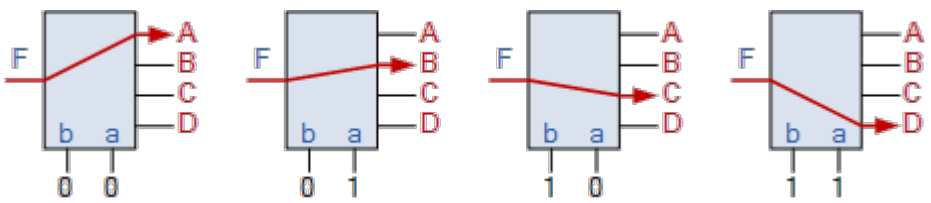
**Explain Voltage regulations circuit.**

The circuit consists of following four parts.

- Reference voltage circuit
- Error amplifier
- Series pass transistor
- Feedback network

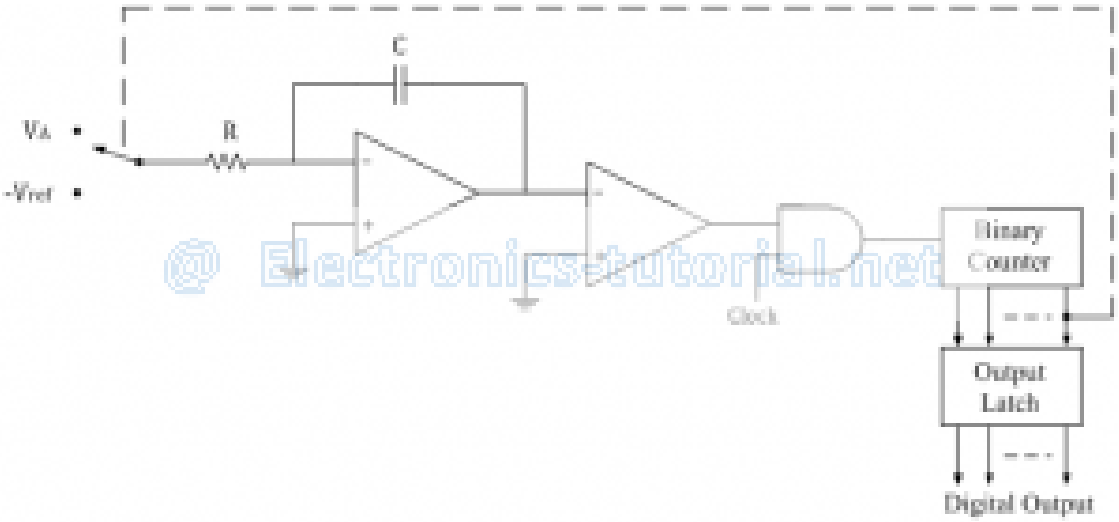
**Explain Demux related switch.**



**Describe Dual Slope Analog to Digital converter.**

in dual slope type ADC, the integrator generates two different ramps, one with the known analog input voltage VA and another with a known reference voltage –Vref. Hence it is called a s dual slope A to D converter. The logic diagram for the same is shown below.




**What is Coil Series Input Impedance.**

The input impedance of an electrical network is the measure of the opposition to current flow (impedance), both static (resistance) and dynamic (reactance), into the load network being connected that is external to the electrical source. The input admittance (1/impedance) is a measure of the load's propensity to draw current. The source network is the portion of the network that transmits power, and the load network is the portion of the network that consumes power.

**Electrical circuit - Power calculation of a circuit (numerical).**

Power Rule: P = I × V
If a current I flows through through a given element in your circuit, losing voltage V in the process, then the power dissipated by that circuit element is the product of that current and voltage: P = I × V.

https://www.evilmadscientist.com/2012/basics-power-dissipation-and-electronic-components/

**Explain Signal Flow Graph (Control System).**

A signal-flow graph or signal-flowgraph (SFG), invented by Claude Shannon,[1] but often called a Mason graph after Samuel Jefferson Mason who coined the term,[2] is a specialized flow graph, a directed graph in which nodes represent system variables, and branches (edges, arcs, or arrows) represent functional connections between pairs of nodes.

https://en.wikipedia.org/wiki/Signal-flow_graph

**Explain  Common Emitter Gain bandwidth Product. (Analog circuits)**

In electronics, a common-emitter amplifier is one of three basic single-stage bipolar-junction-transistor (BJT) amplifier topologies, typically used as the voltage amplifier.

In this circuit the base terminal of the transistor serves as the input, the collector is the output, and the emitter is common to both (for example, it may be tied to ground reference or a power supply rail), hence its name. The analogous FET circuit is the common-source amplifier, and the analogous tube circuit is the common-cathode amplifier.

https://en.wikipedia.org/wiki/Common_emitter

**Explain Source Follower with FET- voltage Gain.**

In electronics, a common-drain amplifier, also known as a source follower, is one of three basic single-stage field effect transistor (FET) amplifier topologies, typically used as a voltage buffer. In this circuit (NMOS) the gate terminal of the transistor serves as the input, the source is the output, and the drain is common to both (input and output), hence its name. The analogous bipolar junction transistor circuit is the common-collector amplifier. This circuit is also commonly called a "stabilizer."

https://en.wikipedia.org/wiki/Common_drain

**Explain Flip Flop.**

In electronics, a flip-flop or latch is a circuit that has two stable states and can be used to store state information. A flip-flop is a bistable multivibrator. The circuit can be made to change state by signals applied to one or more control inputs and will have one or two outputs. It is the basic storage element in sequential logic. Flip-flops and latches are fundamental building blocks of digital electronics systems used in computers, communications, and many other types of systems.

https://en.wikipedia.org/wiki/Flip-flop_(electronics)

**Explain Baud rate.**

The **baud rate** is the **rate** at which information is transferred in a communication channel. In the serial port context, "9600 **baud**" means that the serial port is capable of transferring a maximum of 9600 bits per second.

**Explain Time shared operating system.**

A time sharing operating system is that in which each task is given some time to execute and all tasks are given time so that all processes run seamlessly without any problem. Suppose there are many users attached to a single system then each user has given time of CPU. No user can feel to have trouble in using the system.


https://www.quora.com/What-is-time-sharing-operating-system-with-example

**Explain Time slicing .**

The period of time for which a process is allowed to run in a preemptive multitasking system is generally called the time slice or quantum. The scheduler is run once every time slice to choose the next process to run. The length of each time slice can be critical to balancing system performance vs process responsiveness - if the time slice is too short then the scheduler will consume too much processing time, but if the time slice is too long, processes will take longer to respond to input.

An interrupt is scheduled to allow the operating system kernel to switch between processes when their time slices expire, effectively allowing the processor’s time to be shared between a number of tasks, giving the illusion that it is dealing with these tasks in parallel (simultaneously). The operating system which controls such a design is called a multi-tasking system.

https://en.wikipedia.org/wiki/Preemption_(computing)#Time_slice

**Explain Ebers Moll model.**

Ebers Moll model is a simple and elegant way of representing the transistor as a circuit model. The Ebers Moll model of transistor holds for all regions of operation of transistor. This model is based on assumption that base spreading resistance can be neglected. It will be obvious that why two diodes connected back to back will not function as a transistor from the following discussion, as dependent current source term will be missing which is responsible for all the interesting properties of transistor.

http://ecetutorials.com/analog-electronics/ebers-moll-model-of-transistor/

**Explain the working of following filters - Low pass filter high pass, band pass filter circuit.**

http://www.swarthmore.edu/NatSci/echeeve1/Ref/FilterBkgrnd/Filters.html

**Basic Circuit theory: RC and LC, and RLC circuits, rectifiers.**

https://www.jove.com/science-education/10318/rcrllc-circuits

**Digital electronics:**

**Basic Gates truth table.**

Digital systems are said to be constructed by using logic gates. These gates are the AND, OR, NOT, NAND, NOR, EXOR and EXNOR gates. The basic operations are described below with the aid of truth tables.

**AND gate**


| 2 Input AND gate | | |
|---|---|---|
| A | B | A.B |
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

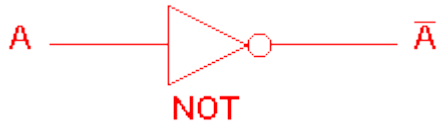
The AND gate is an electronic circuit that gives a **high** output (1) only if all its inputs are high. A dot (.) is used to show the AND operation i.e. A.B. Bear in mind that this dot is sometimes omitted i.e. AB

**OR gate**


| 2 Input OR gate | | |
|---|---|---|
| A | B | A+B |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

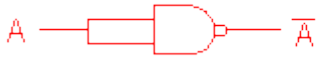
The OR gate is an electronic circuit that gives a high output (1) if **one or more** of its inputs are high. A plus (+) is used to show the OR operation.

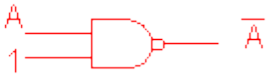
**NOT gate**




| NOT gate | |
|---|---|
| A | $\overline{A}$ |
| 0 | 1 |
| 1 | 0 |

The NOT gate is an electronic circuit that produces an inverted version of the input at its output. It is also known as an inverter. If the input variable is A, the inverted output is known as NOT A. This is also shown as A', or A with a bar over the top, as shown at the outputs. The diagrams below show two ways that the NAND logic gate can be configured to produce a NOT gate. It can also be done using NOR logic gates in the same way.



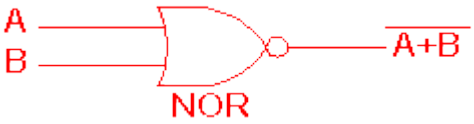




**NAND gate**


| 2 Input NAND gate | | |
|---|---|---|
| A | B | $\overline{A.B}$ |
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

This is a NOT-AND gate which is equal to an AND gate followed by a NOT gate. The outputs of all NAND gates are high if any of the inputs are low. The symbol is an AND gate with a small circle on the output. The small circle represents inversion.

**NOR gate**




| 2 Input NOR gate | | |
|---|---|---|
| A | B | $\overline{A+B}$ |
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

This is a NOT-OR gate which is equal to an OR gate followed by a NOT gate. The outputs of all NOR gates are low if any of the inputs are high.

The symbol is an OR gate with a small circle on the output. The small circle represents inversion.

**EXOR gate**


| 2 Input EXOR gate | | |
|---|---|---|
| A | B | A⊕B |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

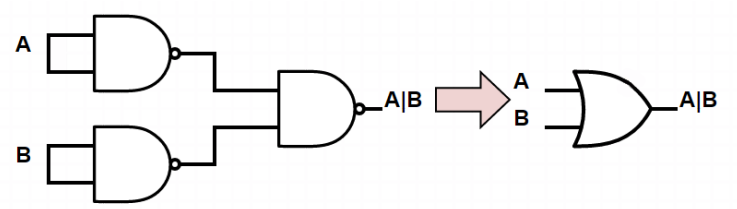
The 'Exclusive-OR' gate is a circuit which will give a high output if either, but not both, of its two inputs are high. An encircled plus sign (⊕) is used to show the EOR operation.

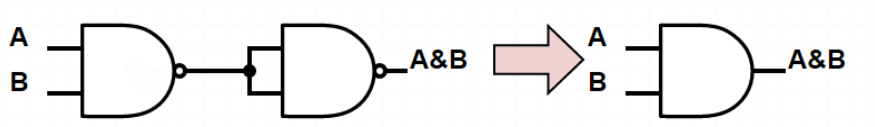
http://www.ee.surrey.ac.uk/Projects/CAL/digital-logic/gatesfunc/

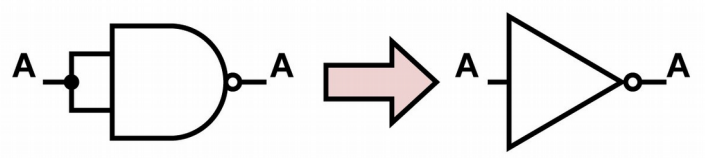
**Explain Universal gates, why they called universal gates?**

A universal logic gate is a logic gate that can be used to construct all other logic gates. NAND and NOR are commonly used universal gates

Design OR, AND, NOT gate using Universal gates.



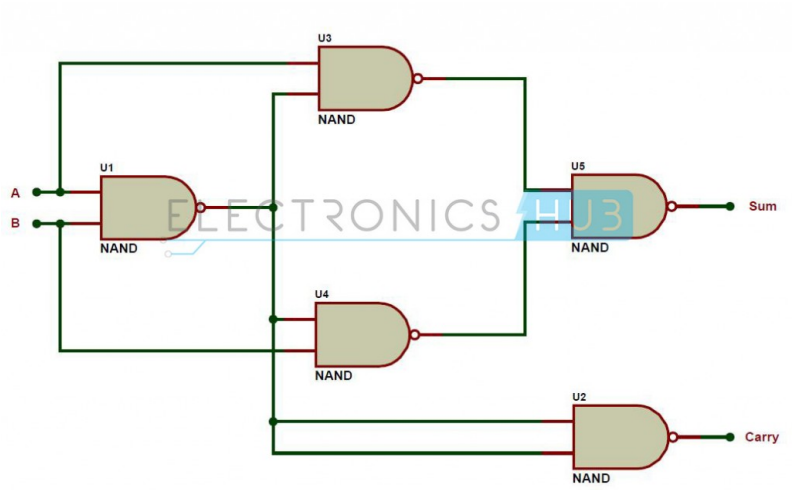

https://www.allaboutcircuits.com/technical-articles/universal-logic-gates/

**What is the difference between Combinational and Sequential circuits?**

| Combinational Logic Circuits | Sequential Logic Circuits |
|---|---|
| Output is a function of the present inputs (Time Independent Logic). | Output is a function of clock, present inputs and the previous states of the system. |
| Do not have the ability to store data (state). | Have memory to store the present states that is sent as control input (enable) for the next operation. |
| It does not require any feedback. It simply outputs the input according to the logic designed. | It involves feedback from output to input that is stored in the memory for the next operation. |
| Used mainly for Arithmetic and Boolean operations. | Used for storing data (and hence used in RAM). |
| Logic gates are the elementary building blocks. | Flip flops (binary storage device) are the elementary building unit. |
| Independent of clock and hence does not require triggering to operate. | Clocked (Triggered for operation with electronic pulses). |
| Example: Adder [1+0=1; Dependency only on present inputs i.e., 1 and 0]. | Example: Counter [Previous O/P +1=Current O/P; Dependency on present input as well as previous state]. |

http://www.vlsifacts.com/difference-combinational-sequential-logic-circuits/

**Draw Half adder and Full adder using NAND gate only.**




https://www.electronicshub.org/half-adder-and-full-adder-circuits/

**What is the difference between multiplexer and decoder? Explain the working.**

**Key Difference:** A multiplexer or MUX is a combination circuit that contains more than one input line, one output line and more than one selection line. Whereas, an encoder is also considered a type of  multiplexer but without a single output line. It is a combinational logic function that has 2^n (or fewer) input lines and n output lines.

http://www.differencebetween.info/difference-between-multiplexer-and-encoder

**Why do we need Asynchronous system?**

In a synchronous system, operations (instructions, calculations, logic, etc.) are coordinated by one, or more, centralized clock signals. An asynchronous digital system, in contrast, has no global clock. Asynchronous systems do not depend on strict arrival times of signals or messages for reliable operation. Coordination is achieved via events such as: packet arrival, changes (transitions) of signals, handshake protocols, and other methods.

https://en.wikipedia.org/wiki/Asynchronous_system

**What is Debouncing in keypad?**

Bouncing is the tendency of any two metal contacts in an electronic device to generate multiple signals as the contacts close or open; debouncing is any kind of hardware device or software that ensures that only a single signal will be acted upon for a single opening or closing of a contact.

http://whatis.techtarget.com/definition/debouncing

**Microcontrollers:**

- Explain memory.
- Explain Stack.
- Explain Banks.

**Analog Circuits:**

BJT and MOSFET application and key factor to decide it.

BJT is current-controlled device where MOSFET is voltage-controlled, both with unique characteristics and their pros and cons. There isn’t a straight-forward and definite answer. When choosing which one to use in your application, one needs to consider some of these questions: power level, drive voltage, load voltage,switching speed, efficiency, cost, etc.

https://oscarliang.com/bjt-vs-mosfet/

Switching and Amplification purpose circuit.

**Signal and systems - Fourier transformation.**

The Fourier transform (FT) decomposes a function of time (a signal) into the frequencies that make it up, in a way similar to how a musical chord can be expressed as the frequencies (or pitches) of its constituent notes

https://en.wikipedia.org/wiki/Fourier_transform

**Expalin the different type of variables? (C programming)**

**Give the size and range of Int, Char, Double, Float. Why we use double?**

**What is the difference between main memory, Stack, Heap, Register memory? (Storage classes)**

**Explain String reassembling .**

**How will you count the number of integers that have occurred more than 3 times in a array?**

**DBMS: Normalization process**

Normalization is a process of reducing redundancies of data in a database. Normalization is a technique that is used when designing and redesigning a database. Normalization is a process or set of guidelines used to optimally design a database to reduce redundant data. The actual guidelines of normalization, called normal forms, will be discussed later in this hour. It was a difficult decision to decide whether to cover normalization in this book because of the complexity involved in understanding the rules of the normal forms this early on in your SQL journey. However, normalization is an important process that, if understood, will increase your understanding of SQL. We have attempted to simplify the process of normalization as much as possible in this hour. At this point, don't be overly concerned with all the specifics of normalization; it is most important to understand the basic concepts.

http://www.informit.com/articles/article.aspx?p=30646

**Difference between synchronous and asynchronous ?**

Synchronous data transfer: sender and receiver use the same clock signal

- supports high data transfer rate
- needs clock signal between the sender and the receiver
- requires master/slave configuration

Asynchronous data transfer: sender provides a synchronization signal to the receiver before starting the transfer of each message

- does not need clock signal between the sender and the receiver
- slower data transfer rate

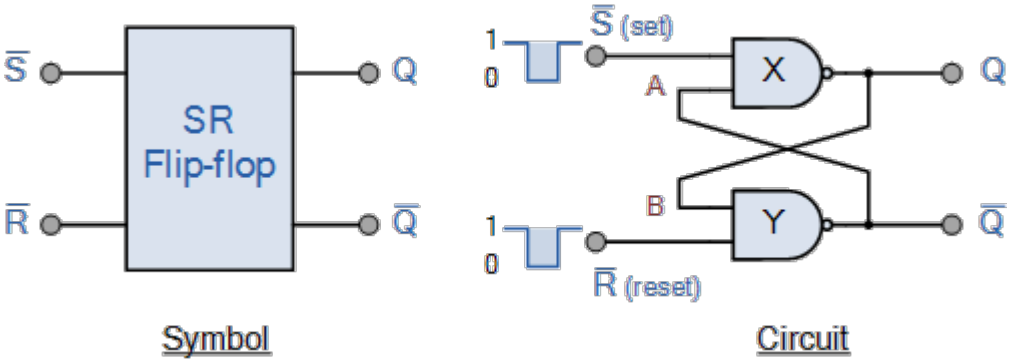
http://www.engr.iupui.edu/~skoskie/ECE362/lecture_notes/LNB25_html/text12.html

**What is positive edge triggered and negative edge triggered?**

An edge-triggered flip-flop changes states either at the positive edge (rising edge) or at the negative edge (falling edge) of the clock pulse on the control input

http://osp.mans.edu.eg/cs212/FF_Edge_Triggered.htm

**Draw and explain SR latch? What is Gated SR latch ? What modifications have to be made to get output, when clock goes high to low?**




http://www.electronics-tutorials.ws/sequential/seq_1.html

**What is sampling? Where it is used ?**

Sampling is a technique that is used to indicate how much data to collect and how often it should be collected.

Data cannot be collected until the sample size (how much) and sample frequency (how often) have been determined.
Generally used in real time signal processing

**How Bluetooth works?**

Bluetooth sends and receives radio waves in a band of 79 different frequencies (channels) centered on 2.45 GHz, set apart from radio, television, and cellphones, and reserved for use by industrial, scientific, and medical gadgets. Don't worry: you're not going to interfere with someone's life-support machine by using Bluetooth in your home, because the low power of your transmitters won't carry your signals that far! Bluetooth's short-range transmitters are one of its biggest plus points. They use virtually no power and, because they don't travel far, are theoretically more secure than wireless networks that operate over longer ranges, such as Wi-Fi. (In practice, there are some security concerns.)

Bluetooth devices automatically detect and connect to one another and up to eight of them can communicate at any one time. They don't interfere with one another because each pair of devices uses a different one of the 79 available channels. If two devices want to talk, they pick a channel randomly and, if that's already taken, randomly switch to one of the others (a technique known as spread-spectrum frequency hopping). To minimize the risks of interference from other electrical appliances (and also to improve security), pairs of devices constantly shift the frequency they're using—thousands of times a second.

When a group of two or more Bluetooth devices are sharing information together, they form a kind of ad-hoc, mini computer network called a piconet. Other devices can join or leave an existing piconet at any time. One device (known as the master) acts as the overall controller of the network, while the others (known as slaves) obey its instructions. Two or more separate piconets can also join up and share information forming what's called a scatternet.

http://www.explainthatstuff.com/howbluetoothworks.html

**Explain the working of USB?**

When the host powers up, it queries all of the devices connected to the bus and assigns each one an address. This process is called enumeration -- devices are also enumerated when they connect to the bus. The host also finds out from each device what type of data transfer it wishes to perform:

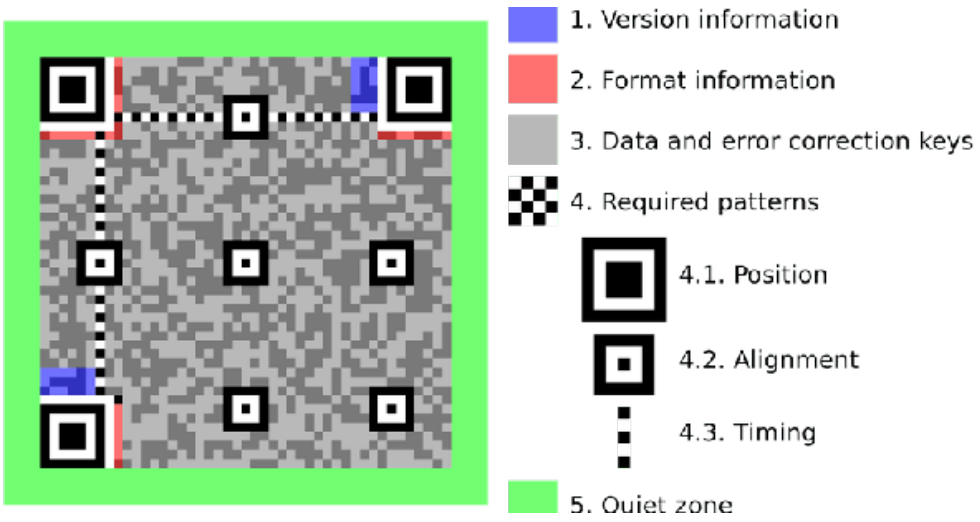
- Interrupt - A device like a mouse or a keyboard, which will be sending very little data, would choose the interrupt mode.
- Bulk - A device like a printer, which receives data in one big packet, uses the bulk transfer mode. A block of data is sent to the printer (in 64-byte chunks) and verified to make sure it's correct.
- Isochronous - A streaming device (such as speakers) uses the isochronous mode. Data streams between the device and the host in real-time, and there is no error correction.

The host can also send commands or query parameters with control packets.

https://computer.howstuffworks.com/usb4.htm

**Explain the working of QR code?**

QR Codes are 2-dimensional, which results in them having a square filled with data. Besides data, there are certain identifiers helping the code being read correctly. The most common QR Code type is model 2, which is broken down in the following information identifiers:



Version and format information are important for the scanning device to know what kind of data to expect. Meanwhile, thedata can be slightly smeared or missing and still be readable. This depends on the error correction level being used when writing the code.

And did you know that you can rotate QR Codes however you like? Upside down will still work! This is a courtesy of the position patterns (squares with dots in the middle) that allow the code to be read from any direction in 360 degrees.

Meanwhile, the alignment patterns are used to assist in navigation of larger codes and the timing patterns are used to determine the size of modules. The quiet zone requires a margin of at least 4-module worth.

https://www.quora.com/How-do-QR-codes-work

**Explain the technical specifications of an accelerometer.**

**Spec Sheet for Sample Accelerometer**
**Accelerometer type:** Piezoelectric, piezoresistive, capacitive, or MEMS

**Amplitude range:** ±500 g peak

**Shock limits:** ±2000 g peak for half-sine excitation pulse of 200 ms or longer

**Temperature range:** –50°C to +100°C operating –65°C to +125°C storage/nonoperating

**Packaging:** Hermetically sealed stainless-steel cylinder measures 1.4 in. from base to 10-32 threaded coaxial connector face, 0.55 in. in diameter. Mounting consists of a 10-32 UNF by 1/2-in. stud pro- truding from 11/16 hex flange on lower end of cylinder.

**Weight:** 1.5 oz

**Base strain sensitivity:** & 0.02 g per microstrain (µe)

**Transverse sensitivity:** &2.5% for 1° positioning error

**Frequency range:** 1 to 2000 Hz, flat within ±5%
0.5 to 3400 Hz, flat within ±10%

**Sensitivity:** 10 mV/g ±10%

**Resolution:** ±0.02 g peak

**Amplitude linearity:** ±0.9% of full scale

**Temperature coefficient of**
**sensitivity:** &0.05% per °C over operating temperature range

**Discharge time constant:** 1 s nominal

**Risetime:** &100 µs

**Excitation voltage:** 15 VDC to 30 VDC

https://www.edn.com/electronics-news/4379981/A-Guide-to-Accelerometer-Specifications

**Explain the circuit and working of a decoder.**

https://www.allaboutcircuits.com/textbook/digital/chpt-9/decoder/

**Explain KVL and KCL with physical significance.**

Kirchhoff's Current Law (KCL)

This is Kirchhoff's first law.

The sum of all currents that enter an electrical circuit junction is 0. The currents enter the junction have positive sign and the currents that leave the junction have a negative sign:

$$\sum_k I_k = 0$$

Another way to look at this law is that the sum of currents that enter a junction is equal to the sum of currents that leave the junction:

Kirchhoff's Current Law (KCL)

This is Kirchhoff's second law.

The sum of all voltages or potential differences in an electrical circuit loop is 0.

$$\sum_k V_k = 0$$

https://www.rapidtables.com/electric/Kirchhoff_laws.html#kvl

**Explain pull-up and pull-down with respect to Micro-controllers**

Pull-up and Pull-downs are normally used to ensure a line has a defined state while not actively driven. They are used on inputs to prevent floating lines, rapidly switching between high and low and a middle "undefined" region. Outputs normally do not need them.

But most mcu pins are GPIO, and sometimes on startup are defined as inputs instead of outputs. As you said, sometimes you don't want an IC pin input floating on startup, especially like a reset pin that you would normally drive with your microcontroller's GPIO.

This is when you use a **Weak** Pull-up or Pull-down on the line. Because they are weak, and you choose the default state, they provide no interference with your circuit (If the input is supposed to be low at all times, then pulled high, you choose a weak pull-down, and vis versa), but they do consume a bit of current. This is why you choose a resistor weak (Higher the value, the weaker) enough for the job.

Another normal output setup that uses pull-ups (or pull-downs, rarer) is **Open Drain** or **Open Collector** connections. These only drive a connection low, or release the line, leaving it floating. The pull-ups are used to bring the line to a high logic state.

https://electronics.stackexchange.com/questions/58502/pull-up-and-pull-down-resistor-usage-on-input-or-output-mcu-pins

**Explain Noise Margin with suitable diagrams.**

In electrical engineering, noise margin is the amount by which a signal exceeds the minimum amount for proper operation. It is commonly used in at least two contexts:

- In communications system engineering, noise margin is the ratio by which the signal exceeds the minimum acceptable amount. It is normally measured in decibels.
- In a digital circuit, the noise margin is the amount by which the signal exceeds the threshold for a proper '0' or '1'. For example, a digital circuit might be designed to swing between 0.0 and 1.2 volts, with anything below 0.2 volts considered a '0', and anything above 1.0 volts considered a '1'. Then the noise margin for a '0' would be the amount that a signal is below 0.2 volts, and the noise margin for a '1' would be the amount by which a signal exceeds 1.0 volt. In this case noise margins are measured as an absolute voltage, not a ratio. Noise margins for CMOS chips are usually much greater than those for TTL because the VOH min is closer to the power supply voltage and VOL max is closer to zero.

https://en.wikipedia.org/wiki/Noise_margin

**Explain the advantages of CMOS compared to TTL.**

CMOS circuits do not draw as much power as TTL circuits while at rest. However, CMOS power consumption increases faster with higher clock speeds than TTL does. Lower current draw requires less power supply distribution, therefore causing a simpler and cheaper design.

- Due to longer rise and fall times, the transmission of digital signals becomes simpler and less expensive with CMOS chips.
- CMOS components are more susceptible to damage from electrostatic discharge than TTL components.

https://knowledge.ni.com/KnowledgeArticleDetails?id=kA00Z000000P9yaSAC

**Why CMOS consumes less power compared to TTL?**

CMOS Ics are based upon Metal Oxide Semiconductor based Field Effect Transistors (MOSFETs for short). Mosfets are voltage controlled transistors, unlike Bipolar Junction Transistors (BJTs), whose working is current dependent. The circuits integrated in TTL ICs use BJTs for logic operations, & due to the current consumption, the over all power consumption is greater in TTL. CMOS, using voltage based transistors for logic operations, consumes much less power.

On the other hand, since TTL has very little parasitic capacitance, the time delay is very small, & TTL is faster. MOSFETs, based on voltage operations, have much greater capacitances, the charging & discharging of which consumes time (Ref: RC time constant), hence CMOS is slower.

https://www.electro-tech-online.com/threads/what-is-the-main-difference-between-cmos-and-ttl-ics.15219/

**What is the size of address lines and data lines in 8051?**

16 bits and 8 Bits

**How interrupts work in 8051? How many interrupts are present?**

Types of Interrupts in 8051 Microcontroller

The 8051 microcontroller can recognize five different events that cause the main program to interrupt from the normal execution. These five sources of interrupts in 8051are:

1. Timer 0 overflow interrupt- TF0
2. Timer 1 overflow interrupt- TF1
3. External hardware interrupt- INT0
4. External hardware interrupt- INT1
5. Serial communication interrupt- RI/TI

https://www.elprocus.com/types-of-interrupts-in-8051-microcontroller-and-interrupt-programming/

**What happens if two interrupts occur at the same time? Which one takes priority?**

Depends on implementation, In PIC for examples

An interrupt is basically that. As to what happens when two interrupts fire at the same time - the result will be the same.. Its down to how you arrange your ISR code…

If your ISR only handles one interrupt at a time, and leaves the other interrupt "un-handled" - when the PIC leaves your ISR code it will be immediately interrupted and sent back to your ISR to handle the "un-handled" interrupt

Some PIC controllers have High and Low priority interrupts - this would make some nice reading for you to understand what is meant by this.

http://www.microchip.com/forums/m239003.aspx

**What is Program counter?**

A program counter is a register in a computer processor that contains the address (location) of the instruction being executed at the current time. As each instruction gets fetched, the program counter increases its stored value by 1. After each instruction is fetched, the program counter points to the next instruction in the sequence. When the computer restarts or is reset, the program counter normally reverts to 0.

http://whatis.techtarget.com/definition/program-counter

**What is trap?**

In computing and operating systems, a trap, also known as an exception or a fault, is typically[NB 1][1] a type of synchronous interrupt typically caused by an exceptional condition (e.g., breakpoint, division by zero, invalid memory access). A trap usually results in a switch to kernel mode, wherein the operating system performs some action before returning control to the originating process.

https://en.wikipedia.org/wiki/Trap_(computing)

**Explain Power distribution and Power control.**

Electric power distribution is the final stage in the delivery of electric power; it carries electricity from the transmission system to individual consumers. Distribution substations connect to the transmission system and lower the transmission voltage to medium voltage ranging between 2kV and 35kV with the use of transformers

https://en.wikipedia.org/wiki/Electric_power_distribution

**What is 8085 supply voltage_____**

5V

**Explain 8051 – PSW.**

The program status word (PSW) register is an 8-bit register. It is also referred to as the *flag register.* Although the PSW register is 8 bits wide, only *6* bits of it are used by the 8051. The two unused bits are user-definable flags. Four of the flags are called *conditional flags,* meaning that they indicate some conditions that result after an instruction is executed. These four are CY (carry), AC (auxiliary carry), P (parity), and OV (overflow).

http://what-when-how.com/8051-microcontroller/8051-flag-bits-and-the-psw-register/

**CMOS has advantage over TTL.**

**a) Low power consumption and high fan out and high noise margin.**

b) Low power consumption and low fan out.

c) High speed with low power consumption.

**How many half adders and Or gate is required to build a 4 Bit Full adder?**

**a) 8&4**

b) 8&3

c) 7&4

d) 7&3

**What is the output voltage if input is 3V with forward loop gain 2 and feedback loop gain of 2?**

a) 1.2

b) 0.6

c) 3.2

**Power output of a rectifier is 40W and Power input is 100W what is the efficiency?**

a) 20%

**b) 40%**

c) 80%

**What are the number of select lines for 32:1 mux?**

a) 3

b) 4

**c) 5**

d) 6

**Number of flip flops needed for mod 34 counter?**

a) 5

**b) 6**

c) 7

d) 8

**Most commonly used scheduling algorithm?**

a) Multilevel queue threading

b) First come first serve

**c) Pre-emptive**

d) Random robin

**Which removes AC signal ?_____**

Decoupling capacitor.

**Digital and analog communication:**

**Explain digital and analog communication.**

Digital:

Digital communications is the physical transfer of data(a digital bit stream) over a point-to-point or point-to-multipoint transmission medium. Examples of such media are copper wires,optical fibers,wireless communication media, and storage media. The data is often represented as an electro-magnetic signal, such as an electrical voltage signal or an infra-red signal.

Analog:

Analog communication is a communication method of conveying voice, data, image, signal or video information using a continuous signal which varies in amplitude, phase, or some other property in proportion to that of a variable. It could be the transfer of an analog source signal using an analog modulation method such as FM or AM, or no modulation at all.

https://www.ukessays.com/essays/engineering/analog-vs-digital-communication.php

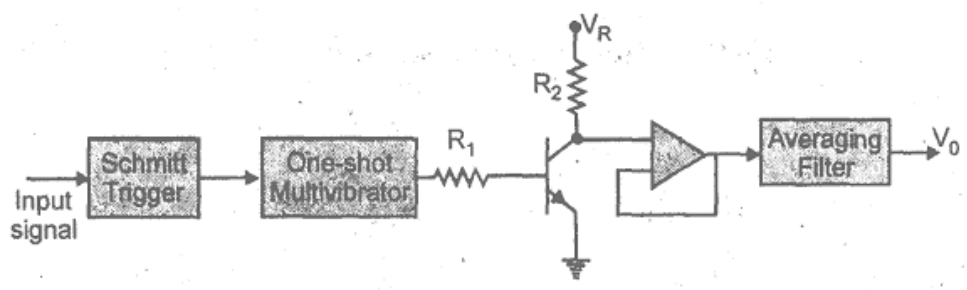
**Explain wave graph equation.**

**Describe Tx and Rx circuit.**

**OP-amp linear integrated circuit.**

**Frequency to voltage amp.**

Frequency to voltage converter is an electronic device which converts the sinusoidal input frequency into a proportional current or output voltage.The basic circuit includes operational amplifiers and RC circuits (Resistor Capacitor networks). The operational amplifiers are used for signal processing. And the RC networks are used to remove the frequency dependent ripples.




The above block diagram shows a frequency to voltage converter. The circuit charges the capacitor to a certain level. An integrator is connected in it and the capacitor discharges into this integrator or a low pass circuit. This happens for all the cycles of the input waveform. The precision switch and the monostable multivibrator generate a pulse of a

specific amplitude and period which is fed into the averaging network. Hence we get a DC voltage at the output.

http://microcontrollerslab.com/frequency-to-voltage-converter-circuits/

**Explain Phase power supply?**

In electrical engineering, single-phase electric power is the distribution of alternating current electric power using a system in which all the voltages of the supply vary in unison. Single-phase distribution is used when loads are mostly lighting and heating, with few large electric motors. A single-phase supply connected to an alternating current electric motor does not produce a revolving magnetic field; single-phase motors need additional circuits for starting (capacitor start motor), and such motors are uncommon above 10 kW in rating.

https://en.wikipedia.org/wiki/Single-phase_electric_power

**Explain step-up/step-down process.**

https://www.allaboutcircuits.com/textbook/alternating-current/chpt-9/step-up-and-step-down-transformers/

**What are encoders, decoders and mux?**

A simple encoder or simply an encoder in digital electronics is a one-hot to binary converter. That is, if there are 2n input lines, and at most only one of them will ever be high, the binary code of this 'hot' line is produced on the n-bit output lines.

For example, a 4-to-2 simple encoder takes 4 input bits and produces 2 output bits. The illustrated gate level example implements the simple encoder defined by the truth table, but it must be understood that for all the non-explicitly defined input combinations (i.e., inputs containing 0, 2, 3, or 4 high bits) the outputs are treated as don't cares.[1]

One may say it is the reverse of a Decoder in its functioning and that is true in terms of functioning.

https://en.wikipedia.org/wiki/Encoder_(digital)

In electronics, a multiplexer (or mux) is a device that selects one of several analog or digital input signals and forwards the selected input into a single line.[1] A multiplexer of 2n inputs has ⌈n⌉ select lines, which are used to select which input line to send to the output.[2] Multiplexers are mainly used to increase the amount of data that can be sent over the network within a certain amount of time and bandwidth.[1] A multiplexer is also called a data selector. Multiplexers can also be used to implement Boolean functions of multiple variables.

An electronic multiplexer makes it possible for several signals to share one device or resource, for example, one A/D converter or one communication line, instead of having one device per input signal.

Conversely, a demultiplexer (or demux) is a device taking a single input signal and selecting one of many data-output-lines, which is connected to the single input. A multiplexer is often used with a complementary demultiplexer on the receiving end

https://en.wikipedia.org/wiki/Multiplexer

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**What is DPTR, SCON? Use of DPTR.**

**Write an assembly code to move a block of data into another.**

**Write an 8051 Assembly code to add two numbers.**

**What will be the output of MUX, if you connect output of encoder to the select lines of MUX?**

**Write a program to check a switch and perform an action according to it.**

**Write a program to change memory location of a byte.**

**Explain Free() function usage**

**Explain Ramp Signal 2 feedback system (Signal and Systems).**

**Explain 8085 Counter program.**

**Explain Ripple factor of J-K flip flop.**

**How will you simplify Logic Gate characteristic equation.**

**Design a counter that counts 1,3 ,5,9 random digits.**

**Design a shift register to change the given number into another one.**

**Voltage to frequency amplifier.**

**Logarithmic amplifier.**

https://en.wikipedia.org/wiki/Log_amplifier

**Questions to identify oscillators like armstrong oscillator (transformer)**

**Why 415 v is 3-pi?**

**Describe 3 – pi transformer design.**

**Which interrupt has highest priority?**

**Find V and I from the given circuit.**

**Explain Time to frequency spectrum conversion.**

**Explain the working of Wire Extender?**

**Questions on using Aurdino.**

**Control System - Basic questions.**

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**What does 8086 S4S3(10) represent _____**