25 Lecture - CS302

Important Subjective

1. **What are asynchronous preset and clear inputs, and why are they used in digital circuits?**
   Answer: Asynchronous preset and clear inputs are signals used in digital circuits to set or reset the output state of a flip-flop or latch regardless of the clock input. These inputs can be used to force a particular state in the flip-flop or latch, regardless of the current state or clock signal.

   What are the advantages and disadvantages of using asynchronous inputs in digital circuits?
   Answer: Asynchronous inputs can be useful in certain situations where the output state needs to be set or reset immediately without waiting for the next clock cycle. However, they can also introduce hazards and timing issues that need to be carefully managed to ensure proper operation of the circuit.

   What is the difference between a synchronous and an asynchronous reset?
   Answer: A synchronous reset is a reset signal that is synchronized with the clock signal, while an asynchronous reset is a reset signal that is not synchronized with the clock signal.

   What is the difference between a latch and a flip-flop?
   Answer: Both latches and flip-flops are used to store data, but a flip-flop is edge-triggered and can only change state on the rising or falling edge of the clock signal, while a latch is level-sensitive and can change state at any time.

   What is a hazard in digital circuits, and how can it be eliminated?
   Answer: A hazard is an unwanted transition in the output of a digital circuit caused by a delay in the propagation of signals through the circuit. Hazards can be eliminated by adding delay elements to the circuit, or by synchronizing the asynchronous inputs with the clock signal.

   What is the difference between an SR latch and a D latch?
   Answer: An SR latch has two inputs (S and R) and two outputs (Q and Q?), while a D latch has one input (D) and two outputs (Q and Q?). The SR latch can be used as a memory element or a basic building block for more complex circuits, while the D latch is used primarily for data storage.

   What is the purpose of a clock signal in a digital circuit?
   Answer: The purpose of a clock signal is to synchronize the operation of digital circuits by providing a timing reference that determines when signals are sampled and when outputs can change state.

   What is the difference between a positive-edge-triggered flip-flop and a negative-edge-triggered flip-flop?
   Answer: A positive-edge-triggered flip-flop changes state on the rising edge of the clock signal, while a negative-edge-triggered flip-flop changes state on the falling edge of the clock signal.

   What is meant by the term "metastability" in digital circuits, and how can it be avoided?
   Answer: Metastability is a condition in which a flip-flop or latch enters an unpredictable state due

to the input signal arriving at an uncertain time. Metastability can be avoided by using synchronous inputs or adding delay elements to the circuit.

How can asynchronous inputs be used to implement a counter in a digital circuit?
Answer: Asynchronous inputs can be used to force the output of a flip-flop to a particular state, which can be used to implement a counter by connecting several flip-flops together in a cascade and using the asynchronous inputs to preset or clear the outputs of each flip-flop.