

1. What is meant by Edge triggered flip flops.

* An edge triggered flip-flop is a modification to the latch which allows the state to only change during a small period of time when the clock pulse is changing from 0 to 1.

* It is said to trigger on the edge of the clock pulse, and thus is called an edge-triggered flip-flop.

2. Give the characteristic equation of SR flip-flop

$$Q(t+1) = S + R^1 Q$$

3. What is the minimum number of flip-flops needed to build a Mod 8 Counter?

The minimum needed flip-flops are given as 2^n .

where, n = no. of flip-flops

So a 3-flip flop counter will have a maximum count of $2^3 = 8$ counting states and would be called MOD-8 counter.

4. What is the drawback of SR flip-flop? How is it avoided in JK flip flop.

- * When the S and R inputs of an SR flipflop are at logical 1, then the output becomes unstable and it is known as a race condition. So, the main disadvantage of SR flip flop is invalid output when both inputs are high
- * The only difference between JK flip flop and SR flip flop is that when both inputs of SR flip flop is set to 1, the circuit produces the invalid states as outputs, but in case of JK flip flop, there are no invalid states even if both 'J' and 'K' flip flops are set to 1.

5. What is Lockout? How it is avoided

- * Lockout refers to the principle of shutting down an energy source correctly, draining any excess energy and applying devices to that energy source that prevent it from being released.
- * The lockout can be avoided by designing its state transition such as to give its next state from all of its unused state to (may be) initial state. This is said to be lock free arrangement.

6. Define State table

A table, which consists of time sequence of inputs, outputs and flip flop states, is called state table. Generally it consists of three section present state, next state and output

7. What is Ripple counter

A ripple counter is nothing but an asynchronous counter, in which the output of the flip-flop changes states like a ripple in water.

8. What are the uses of Ring Counter

i) Control section of a digital system

ii) Controlling events, this occurs in strict time sequence

9. What is Johnson Counter

* A Johnson Counter is a ring counter in which the inverted output is fed into the input.

* It is also known as twisted ring counter.

10. Summarize the excitation table of JKFF

$Q(t)$	$Q(t+1)$	J	K
0	0	0	x
0	1	1	x
1	0	x	1
1	1	x	0

11. Differences between Latch and Flip-flop

Latch	Flip flop
<ul style="list-style-type: none">* Latch is a level-triggered type.* The output of a latch changes whenever the input changes.	<ul style="list-style-type: none">* Flip-flop is an edge-triggered type.* The output of flip flop doesn't change for every input change.

12. Differences between Synchronous and Asynchronous counter

Synchronous	Asynchronous
<ul style="list-style-type: none">* Clock pulse is applied simultaneously* Speed of operation is high.	<ul style="list-style-type: none">* Clock pulse is applied to the first flip-flop, the change of output is given as clock to next flip-flop.* Speed of operation is low.

13. What is Primitive Flow table

A primitive flow table is a flow table with only one stable total state in each row. The total state consists of the internal state combined with the input.

14. Write short note on shared row state assignment

* Races can be avoided by making a proper binary assignment to the state variables. Here, the state variables are assigned with binary numbers in such a way that only one state variable can change at any one state variable can change at any one time when a state transition occurs.

* To accomplish this, it is necessary that states between which transitions occur be given adjacent assignment. Two binary are said to be adjacent if they differ in only one variable.

15. What is hazard and give its types?

Definition: Hazards are unwanted switching transients that may appear at the output of a circuit because different paths exhibit different propagation delays.

Types:

- 1) static - 0 hazards
- 2) static - 1 hazard
- 3) Dynamic hazards

16. What is a fundamental mode asynchronous sequential circuit.

* A transition from one stable state to another occurs only in response to a change in input state. After a change in one input has occurred, no other change in any input occurs until the circuit enters a stable state. Such a mode of operation is referred to as a fundamental mode asynchronous sequential circuit.

17. What is a pulse mode asynchronous sequential circuit.

Pulse mode asynchronous circuits:

* The input variables are allowed to be applied in the form of pulses, rather than in form of levels.

* But the width of input pulses is a critical parameter. There are two restrictions on the width of the input pulses.

18. How can the hazards in combinational circuit be removed?

* Hazards in combinational circuits can be removed by covering any two min terms that may produce a hazard with a product term common to both. The removal of hazards requires the addition of redundant

gates to the circuit.

19. Give the procedural steps for determining the Compatible Pairs used for the purpose of Merging a Flow table.

The purpose of merging a flow table can be divided into 3 procedural steps:

- i) Determine all compatible pairs by using the implication table.
- ii) Find the maximal compatibles using a Merger diagram
- iii) Find a minimal collection of compatibles that covers all the states and is closed.

20. Define Essential Hazards

- * A type of hazard that occurs in asynchronous sequential circuit which is caused by unequal delays along two or more paths that originate from the same input.
- * Essential hazards cannot be corrected by adding redundant gates as in static hazards.

21) Differentiate stable and unstable state.

Stable	Unstable
<ul style="list-style-type: none">* stable states : $y_1 y_2 x = 000, 011, 110, 101$* The stable states in a flow table have specific output values associated with them.	<ul style="list-style-type: none">* unstable states : $y_1 y_2 x = 001, 010, 111, 100.$* The unstable states have unspecified output values denoted by a dash.

22) Differentiate critical and non-critical races

Critical Race	Non-critical Race
<ul style="list-style-type: none">* Occurs when the sequence in which internal variables change determines the final state of the machine.	<ul style="list-style-type: none">* A non-critical race occurs when the sequence in which internal variables' changes do not have any impact on the final state of the machine.

23) Summarise Hazards occur in Sequential circuit ? If so what is the problem cause.

- * Yes, Hazards occur in sequential circuit that is asynchronous sequential circuit.
- * It may result in a transition to a wrong state.