

3.4.3 Two marks Questions and Answers

1. What are the classifications of sequential circuits?

The sequential circuits are classified on the basis of timing of their signals into two types. They are:

- i. Synchronous sequential circuit.
- ii. Asynchronous sequential circuit.

2. Define Flip flop.

The basic unit for storage is flip flop. A flip-flop maintains its output state either at 1 or 0 until directed by an input signal to change its state.

3. What are the different types of flip-flop?

There are various types of flip flops. Some of them are mentioned below they are:

- a. SR flip-flop
- b. D flip-flop
- c. JK flip-flop
- d. T flip-flop

4. What is the operation of D flip-flop?

In D flip-flop during the occurrence of clock pulse if $D=1$, the output Q is set and if $D=0$, the output is reset. Set – 1, Reset – 0.

5. What is the operation of JK flip-flop?

- a. When K input is low and J input is high the Q output of flip-flop is set.
- b. When K input is high and J input is low the Q output of flip-flop is reset.
- c. When both the inputs K and J are low the output does not change
- d. When both the inputs K and J are high it is possible to set or reset the flip-flop (ie) the output toggle on the next positive clock edge.

6. What is the operation of T flip-flop?

T flip-flop is also known as Toggle flip-flop.

1. When $T=0$ there is no change in the output.
2. When $T=1$ the output switch to the complement state (ie) the output toggles.

7. Define race around condition.

In JK flip-flop output is fed back to the input. Therefore change in the output results change in the input. Due to this in the positive half of the clock pulse if both J and K are high then output toggles continuously. This condition is called 'race around condition'.

8. What is edge-triggered flip-flop?

The problem of race around condition can be solved by edge triggering flip flop. The term edge triggering means that the flip-flop changes state either at the positive edge or negative edge of the clock pulse and it is sensitive to its inputs only at this transition of the clock.

9. What is a master-slave flip-flop?

Master-slave flip-flop consists of two flip-flops where one circuit serves as a master and the other as a slave.

10. Define rise time.

The time required to change the voltage level from 10% to 90% is known as rise time(t_r).

11. Define fall time.

The time required to change the voltage level from 90% to 10% is known as fall time(t_f).

12. Define skew and clock skew.

The phase shift between the rectangular clock waveforms is referred to as skew and the time delay between the two clock pulses is called clock skew.

13. Define setup time.

The setup time is the minimum time required to maintain a constant voltage levels at the excitation inputs of the flip-flop device prior to the triggering edge of the clock pulse in order for the levels to be reliably clocked into the flip flop. It is denoted as t_{setup} .

14. Define hold time.

The hold time is the minimum time for which the voltage levels at the excitation inputs must remain constant after the triggering edge of the clock pulse in order for the levels to be reliably clocked into the flip flop. It is denoted as t_{hold} .

15. Define propagation delay.

A propagation delay is the time required to change the output after the application of the input.

16. Define register.

Register is a group of flip-flops; flip-flop can store one bit information. So an n-bit register has a group of n flip-flops and is capable of storing any binary information/number containing n-bits.

17. Define shift registers.

The binary information in a register can be moved from stage to stage within the register or into or out of the register upon application of clock pulses. This type of bit movement or shifting is essential for certain arithmetic and logic operations used in microprocessors. This gives rise to group of registers called shift registers.

18. What are the different types of shift type?

There are five types. They are:

- a. Serial In Serial Out Shift Register
- b. Serial In Parallel Out Shift Register
- c. Parallel In Serial Out Shift Register
- d. Parallel In Parallel Out Shift Register
- e. Bidirectional Shift Register

19. Define sequential circuit?

In sequential circuits the output variables dependent not only on the present input variables but they also depend up on the past output of these input variables.

20. What do you mean by present state?

The information stored in the memory elements at any given time defines the present state of the sequential circuit.

21. What do you mean by next state?

The present state and the external inputs determine the outputs and the next state of the sequential circuit.

22. Define synchronous sequential circuit

In synchronous sequential circuits, signals can affect the memory elements only at discrete instant of time.

23. Applications of Flip-Flop.

Used as a memory Element.

Used as a Delay Element.

Used as a basic building block in sequential circuits such as counters and registers.

Data Transfer.

Frequency Division & Counting.

24. Steps or Design procedure for Synchronous Counter.

- i. State Diagram.
- ii. State Table.
- iii. State Assignment.
- iv. Excitation Table (Consider which Memory Unit Using)
- v. K-Map
- vi. Circuit Diagram.

25. Give some applications of clocked RS Flip-flop.

- a. Clocked RS flip flops are used in Calculators & Computers.
- b. It is widely used in modern electronic products.

26. Define Shift Register Counter.

A shift register can also be used as a counter. A shift register with the serial output connection back to the serial input is called Shift register counter.

27. What are the two types of shift register counters?

There are 2 types of shift Register counters are:

- i). Ring counter: A ring counter is a circular shift register with only one flip flop being set, at any particular time, all others are cleared.
- ii). Johnson counter: The Johnson counter is a K-bit switch-tail ring counter with 2k decoding gates to provides outputs for 2 k timing signals.

28. Define state diagram.

A graphical representation of a state table is called a state diagram.

29. What is the use of state diagram?

Behavior of a state machine can be analyzed rapidly.

It can be used to design a machine from a set of specification.

30. What is state table?

Table, which consists 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.

31. What is a state equation?

State equation also called, as an application equation is an algebraic expression that specifies the condition for a flip-flop state transition. The left side of the equation

denotes the next state of the flip-flop and the right side; a Boolean function specifies the present state.

32. What is bi-directional shift register and unidirectional shift register?

A register capable of shifting both right and left is called bi-directional shift register. Register capable of shifting only one direction is called unidirectional shift register.