

UNIT IV

ASYNCHRONOUS SEQUENTIAL LOGIC

Part A – 2 Marks

1. Define Asynchronous sequential circuit?

In asynchronous sequential circuits change in input signals can affect memory element at any instant of time.

2. Comparison between synchronous & Asynchronous sequential circuits?

Synchronous sequential circuits	Asynchronous sequential circuits
Memory elements are clocked flip-flops	Memory elements are either unlocked flip-flops or time delay elements.
Easier to design.	More difficult to design.

3. What is fundamental mode sequential circuit?

- input variables changes if the circuit is stable
- inputs are levels, not pulses
- only one input can change at a given time.

4. What is the significance of state assignment?

In synchronous circuits-state assignments are made with the objective of circuit reduction. Asynchronous circuits-its objective is to avoid critical races.

5. When do race conditions occur?

Two or more binary state variables change their value in response to the change in input variable.

6. 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 assignments. Two binary are said to be adjacent if they differ in only one variable.

7. Write short note on one hot state assignment.

The one hot state assignment is another method for finding a race free state assignment. In this method, only one variable is active or hot for each row in the original flow table, i.e., it requires one state variable for each row of the flow table. Additional row are introduced to provide single variable changes between internal state transitions.

9. What are the different techniques used in state assignment?

- x shared row state assignment
- x one hot state assignment

9. What are the steps for the design of asynchronous sequential circuit?

- construction of primitive flow table
- reduction of flow table
- state assignment is made
- realization of primitive flow table

10. What is hazard?

Hazard is an unwanted switching transient.

11. What are the steps for the design of asynchronous sequential circuit?

1. Construction of a primitive flow table from the problem statement.
2. Primitive flow table is reduced by eliminating redundant states using the state reduction
3. State assignment is made
4. The primitive flow table is realized using appropriate logic elements.

12. Give the comparison between state Assignment Synchronous circuit and state assignment asynchronous circuit.

In synchronous circuit, the state assignments are made with the objective of circuit reduction. In asynchronous circuits, the objective of state assignment is to avoid critical races.

13. What are races?

When 2 or more binary state variables change their value in response to a change in an input variable, race condition occurs in an asynchronous sequential circuit. In case of unequal delays, a race condition may cause the state variables to change in an unpredictable manner.

14. Define non critical race.

If the final stable state that the circuit reaches does not depend on the order in which the state variable changes, the race condition is not harmful and it is called a non critical race.

15. Define critical race?

If the final stable state depends on the order in which the state variable changes, the race condition is harmful and it is called a critical race.

16. Define flow table in asynchronous sequential circuit.

In asynchronous sequential circuit state table is known as flow table because of the behavior of the asynchronous sequential circuit. The stage changes occur in independent of a clock, based on the logic propagation delay, and cause the states to flow from one to another.

17. Define merger graph.

The merger graph is defined as follows. It contains the same number of vertices as the state table contains states. A line drawn between the two state vertices indicates each compatible state pair. If two states are incompatible no connecting line is drawn.

18. What is fundamental mode?

A transition from one stable state to another occurs only in response to a change in the 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.