(*) Sequential Logic

^ The outputs of a COMBINATIONAL circuit at ANY instant of time are ENTIRELY dependent upon the inputs present at THAT time, taking into account the PROPAGATION delays.

However, in a SEQUENTIAL circuit, MEMORY elements are present as well.
The information stored in the MEMORY elements at any given time defines the present INTERNAL STATE of the sequential circuit.
The external OUTPUTS and the next INTERNAL STATE in a sequential circuit are both functions of the external INPUTS and the present INTERNAL STATE.
Thus, a sequential circuit is specified by a time sequence of EXTERNAL INPUTS, EXTERNAL OUTPUTS and INTERNAL STATES.

FIGURE 6-1
Block diagram of a sequential circuit
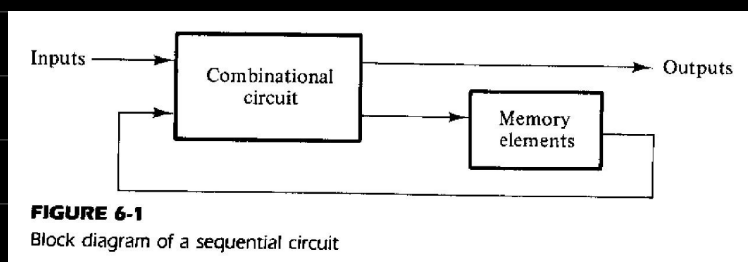
A SYNCHRONOUS sequential circuit is a system whose behaviour can be defined from the knowledge of its signals at DISCRETE instants of time.
The behaviour of an ASYNCHRONOUS sequential circuit depends upon the ORDER in which its input signals change and can be affected at ANY instant of time.

In a SYNCHRONOUS sequential circuit, signals may affect the MEMORY elements only at DISCRETE

The MEMORY elements used in ASYNCHRONOUS sequential circuits are TIME-DELAY devices, whose memory capability is due to the FINITE amounts of time it takes for signals to PROPAGATE through devices. Instead of using physical time-delay devices, LOGIC GATES may also be used to produce the same effect due to their internal PROPAGATION delays. Thus, an asynchronous sequential circuit may be regarded as a COMBINATIONAL circuit with FEEDBACK.

Because of the feedback among logic gates, an asynchronous sequential circuit may, at times, become UNSTABLE.