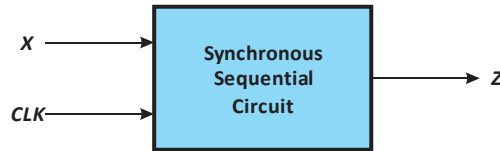Example: Define an arbitrary sequential circuit having a block diagram as shown below.
First, define inputs and outputs using a block diagram
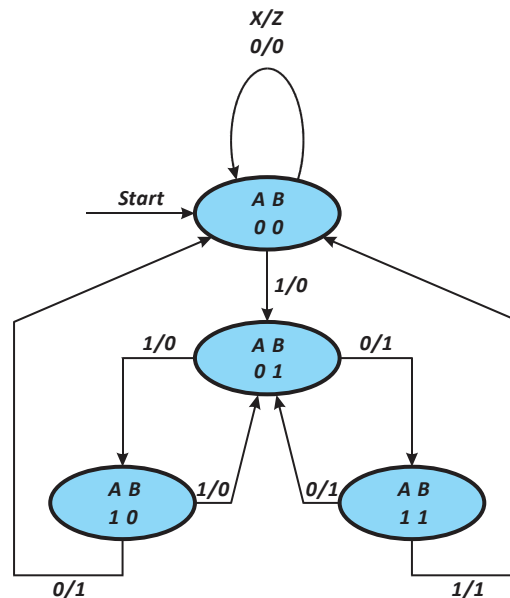

Arbitrary Synchronous Sequential Circuit Block Diagram

Notes:
1. Inputs, X and CLK, are on the *left*. Inputs are binary signals having a value of either 0 or 1.
2. Output, Z, is on the *right*.
3. A synchronous circuit means a circuit that makes transitions on a clock pulse, perhaps, the rising edge of the clock.
4. A sequential circuit means the circuit is a finite state machine and has memory implemented as flip-flops.

Next, define the function of the circuit in a state diagram.

Arbitrary Synchronous Sequential Circuit State Diagram

Notes:
1. Flip-Flops A and B are identified in every state. We know that two flip-flops can provide a maximum of four states, all of which are assigned in this diagram.
2. Directed edges in the diagram are labeled X/Z, where X and Z are binary values. The first value X is the input value and the second value Z is the output value.
3. We have one input, X, that can take on two values, 0 and 1, meaning that every state must have two directed edges (arrows) leaving the state, one labeled 0 and the other labeled 1.