EC - 262 DIGITAL ELECTRONICS
Assignment III
Ritik Singh   2k19/CO/319

Q1. Finite State Machines, or "Finite Automata", are digital circuits that generally compose of combinational and sequential logic sections.

Such a machine is said to be "Synchronous" when it is controlled by a clock signal.

When its operation is said to be independent of the clock, it is known as an "asynchronous" machine.

These can be categorized as the following:

- Finite State machines with NO output:
    - Deterministic Finite Automata (DFA)
    - Non-Deterministic Finite Automata (NFA)
    - ϵ Non-Deterministic Finite Automata (ϵ - NFA)
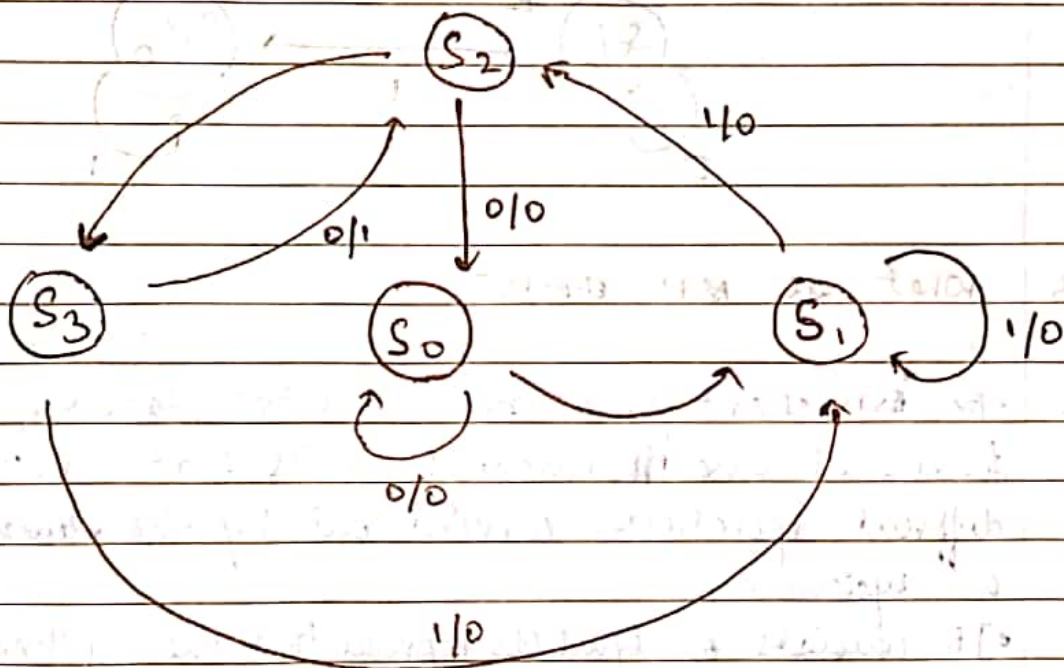
- Finite Automata with outputs:
    - Moore State Machine: The state machine output primarily depends on the present state.
    - Mealy State Machine: The state machine output depends on the present state as well as the input.

Q2 Make the state diagram of 1010 sequence detector using Mealy and Moone Machines.

Ans Mealy Model:

let us say that the output shall be '1' when the final digit of the Pattern is encountered, otherwise it shall be '0'.

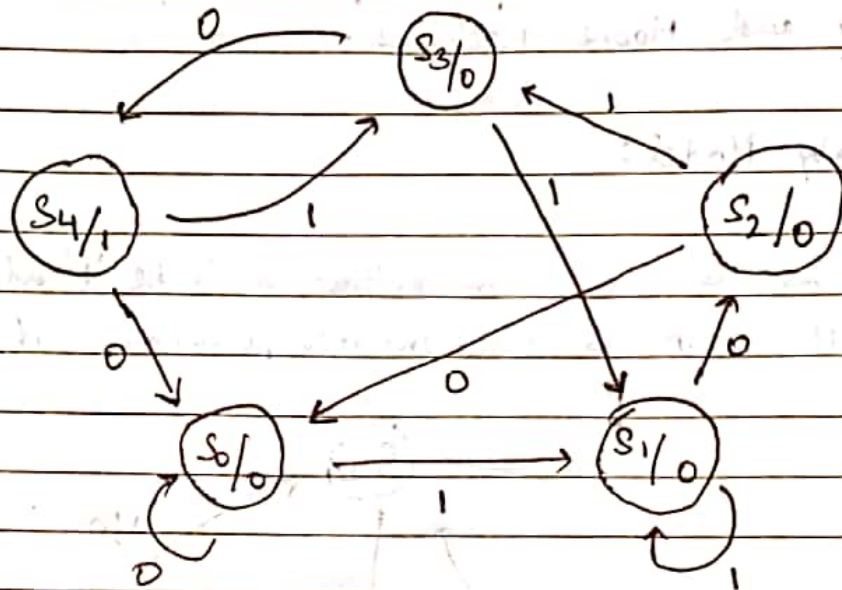This machine takes into consideration overlapping patterns.
eg
    Input :   0010 1010 111

    Output : 000000101000 ...

Moore Model:

Q3 What are ASM charts?

Ans
- An ASM chart is a graphical representation of the functional and heirarchical links that exist b/w different operations carried out by the elements of a system.
- It consists of symbols representing the different types of operations as well as lines and arrows that indicate the relationships that exist between these operations.
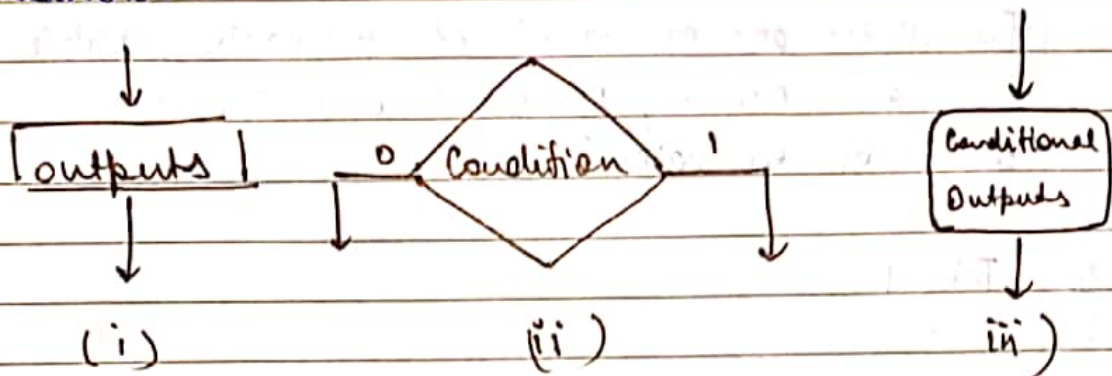
- There are 3 types of symbols used in the construction of ASM charts:
- Rectangle: required to represent the outputs that are not dependent on the input conditions, such as flip-flop outputs.
- Diamond/Hexagon: associated with a condition that governs one or several inputs and that

modifies the execution of operations depending on whether or not the condition is satisfied.

- Rectangle with rounded corners : used to yield conditional outputs or the outputs that are dependent on input combination.

| outputs | ₀ < Condition > ₁ | Conditional Outputs |

(i)   (ii)   (iii)

Q4 Explain the concept of state Assignments and minimization of flow tables.

Ans (i) State Assignments :

are a binary encoding used to represent states of a sequential machine in its digital circuit implementation. This refers to using state variables to define a specific state, and how the values of the state variables are determined.

ii) Minimization of Flow Tables:

A "Flow table" is a tabular transposition of the possible transitions and outposts for each input combination of an asynchronous state machines. It highlights the stable states, which are excited, while the other states are unstable.

The procedure for reducing the number of internal states of sequential circuits can be termed as <u>minimization of flow table.</u>

This reduction procedure for completely specified state tables is based on an algorithm that combines two states in a state table as long as they can chosen to be equivalent.

Two states are equivalent if for each possible input, they give exactly the same output and goto the same or equivalent states.

eg. Table 1

Present state	Next x=0	x=1	Output x=0	x=1
a	d	b	0	0
b	e	a	0	0
c	g	f	0	1
d	a	d	1	0
e	a	d	1	0
f	e	b	0	0
g	a	e	1	0

Table -1 Reduced

Present State	Next x=0	x=1	Output x=0	x=1
a	d	a	0	0
e	d	f	0	1
d	a	d	1	0
f	e	a	0	0