Q1. What are finite state machines and it's types?

A. 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 it's 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)

    - E Non-Deterministic finite Automata (E-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 Moore Machines.

A. 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'.
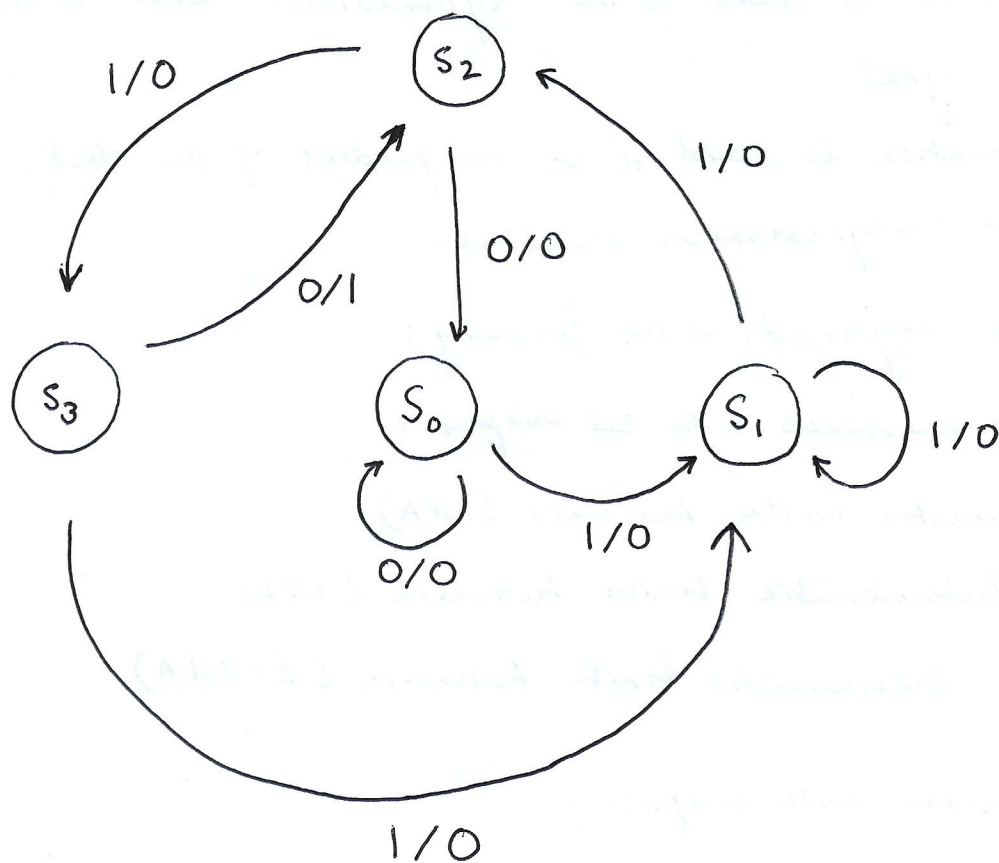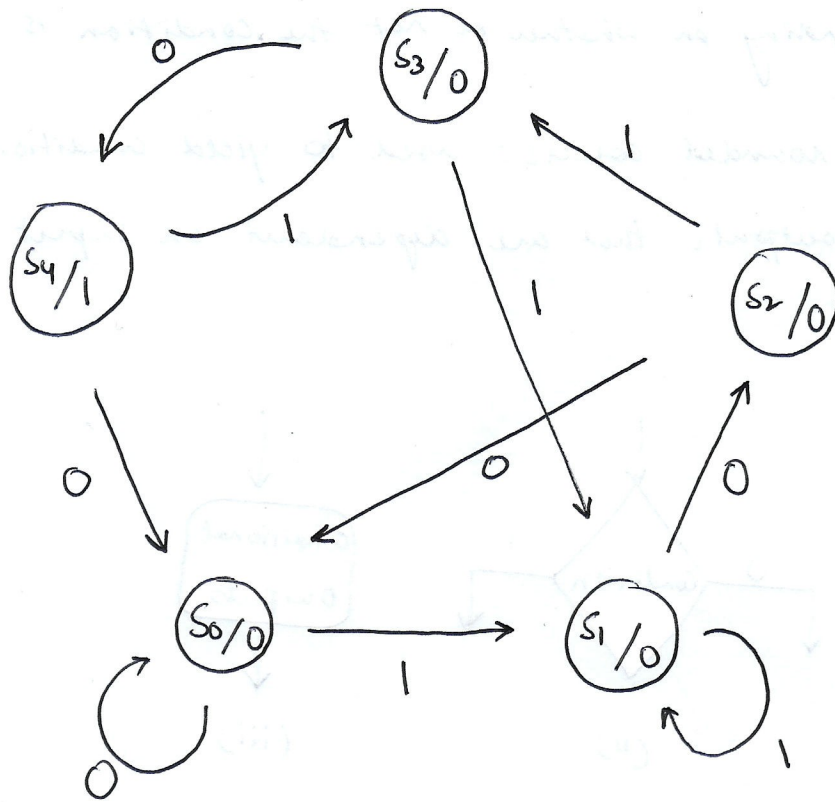

This machine takes into consideration overlapping patterns.

y: Input : 001010101 0 111 ...

   Output : 0 00000101000 ...

Moore Model :

Q3. What Are ASM charts ?

1. • An ASM chart is a graphical representation of the functional and hierarchical links that exist between 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 dependant 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 dependant on input combination.

(i)   (ii)   (iii)
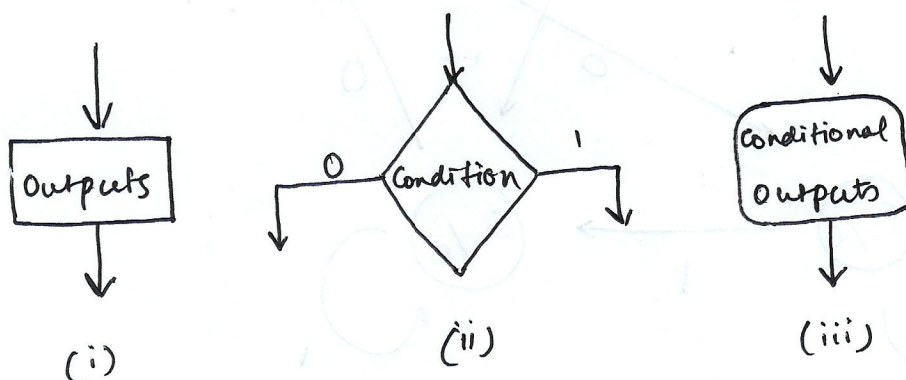
Q4. Explain the concept of State Assignments and Minimization of flow tables.

A. (i) State Assignments:

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 outputs for each input combination of

an asynchronous state machine. It highlights the stable states, which are encircled, 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 shown to be equivalent".

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

g.

Table 1.

Present State	Next x = 0	Next x = 1	Output x = 0	Output 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	c	b	0	0
g	a	e	1	0

Table 1 - Reduced.

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

Minimization