Algorithm State Machines(ASM)

ASM stands for 'Algorithm State Machine 'or simply state machine is the another name given to sequential network is used to control a digital system which carries out a step by a step –by step procedure .It should be noted that ASM charts represent physical hardware and offers several advantages.

1. Operation of a digital system can be easily understand by inspection of the SM chart .
2. ASM charts represent physical hardware.
3. The ASM chart are equivalent to a state graph, and it leads directly to a hardware realization .
4. ASM charts can be described the operation of both combinational and sequential circuits .
5. ASM charts are easier to understand and can be converted several equivalent form.
6. The ASM chart may be equivalently expressed as a state and output table .

Principal Component Of An ASM Chart

- **State Box**. The state of the system is represented by a state box .It is a rectangular box .At the top left hand corner the name of state is shown ,which at the top right hand corner the state assignment is given .Within the state box ,the output signals are listed .
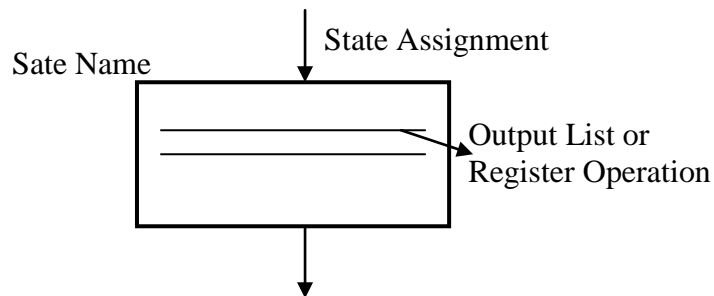
State Assignment

Sate Name

Output List or
Register Operation

Fig. State box

- **Decision box .**It a diamond –shaped box with true false branches .Boolean condition is placed in the box and the decision is made from the value of one or more input signals .The decision box must follow and be associated with a state .
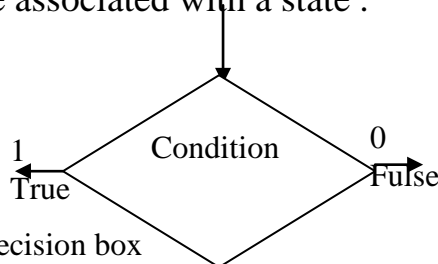
1
True

Condition

0
Fulse

Fig. Decision box

- **Conditional output box .**A condition output box is shown in Fig. is a rectangular box with curved ends .It contain conditional output list .The conditional output depends on both the state of the system and the inputs .Therefore the conditional output signals are sometimes known as Mealy output .A condition output must follow a decision box

Conditional output box
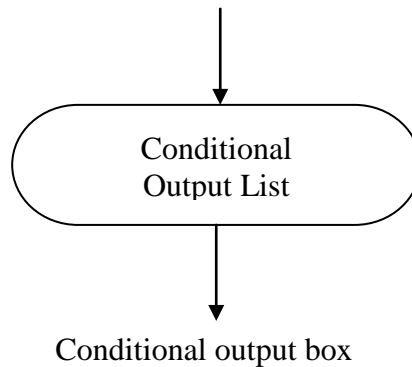
Equivalent ASM charts

ASM charts are not unique, it may have more than one equivalent form Fig. shown three equivalent ASM charts for combinational network Z=A(B+C).
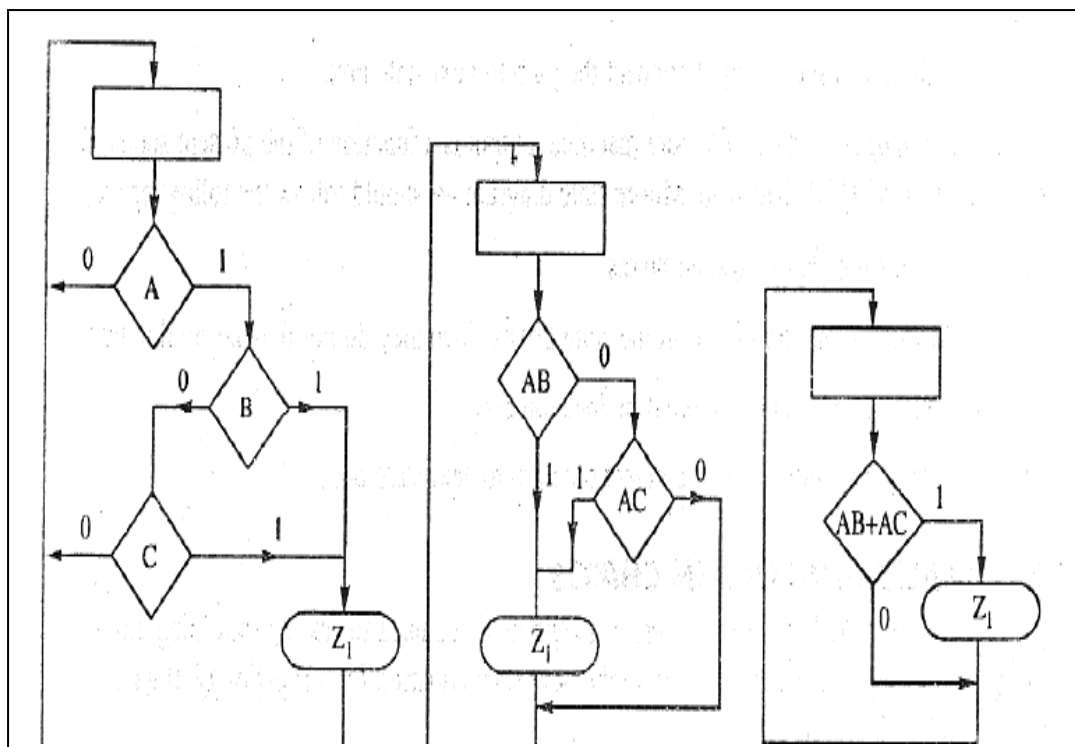
Fig. Equivalent ASM charts for Z=A(B+C)

Conversion Of State Diagram To An ASM Chart

ASM chart can be derived derived an ASM from state diagram of machine ,but certain rules must be followed when constructing an ASM block. First for every valid combination of input, there must be exactly one exit path defined .Second ,no internal feedback within an SM block is allowed.

Mealy Machine. In case of Mealy machine ,output is a function of both present state and input . For construction of ASM chart from Mealy state diagram ,we should follow the following steps.

1. Represent each states by state boxes.
2. Put input in decision box after each state box.
3. The Mealy output appear in conditional output boxes since they depend on both the state and input.
4. Mealy circuit output written only when it is equal to '1' i.e. true .
5. Depending on value of input connect the path to next state box.

Example1

Convert the state diagram diagram of Fig. below to ASM chart.

Solution
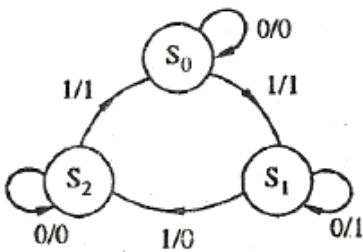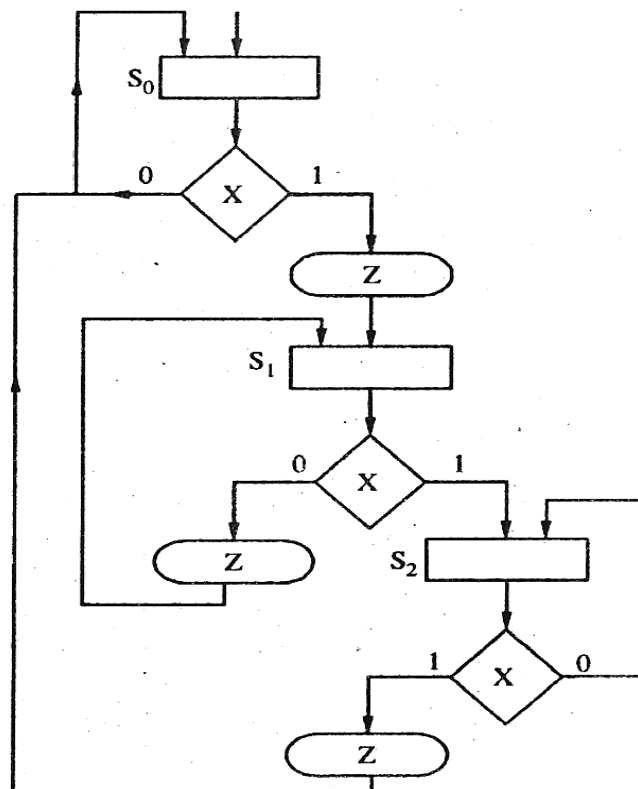
Fig.State diagram

Fig.ASM chart

Example2

Dram an ASM chart to describe a mealy state machine that detects a sequence of 101 and that asserts a logical 1 at the output during the last state of the sequence .
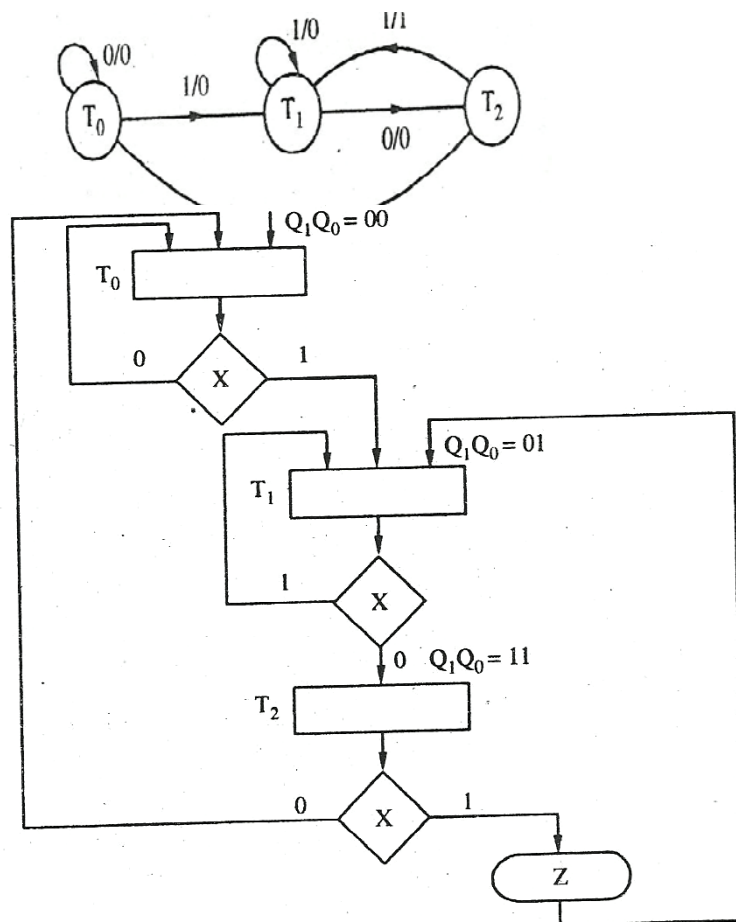
Solution

Fig.ASM chart

Moore Machine . In case of Moore machine ,output is a function of the present state only . For construction of ASM chart from Moore state diagram ,we should follow the following steps

1. Represent each states by state boxes.
2. The Moore output are placed in the state boxes since they do not depend on the input .
3. After each state box put the input in decision box.
4. Depending on value of input connect the path to next state box.

Example3

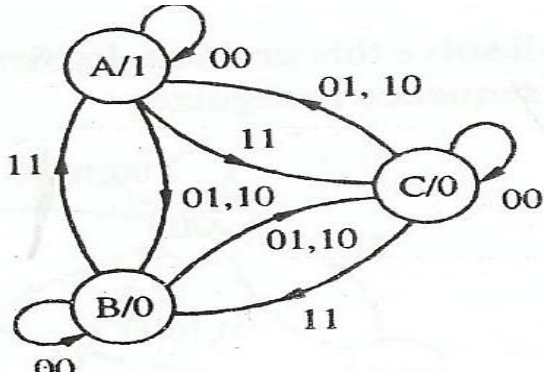Convert the state diagram diagram of Fig. below to ASM chart.
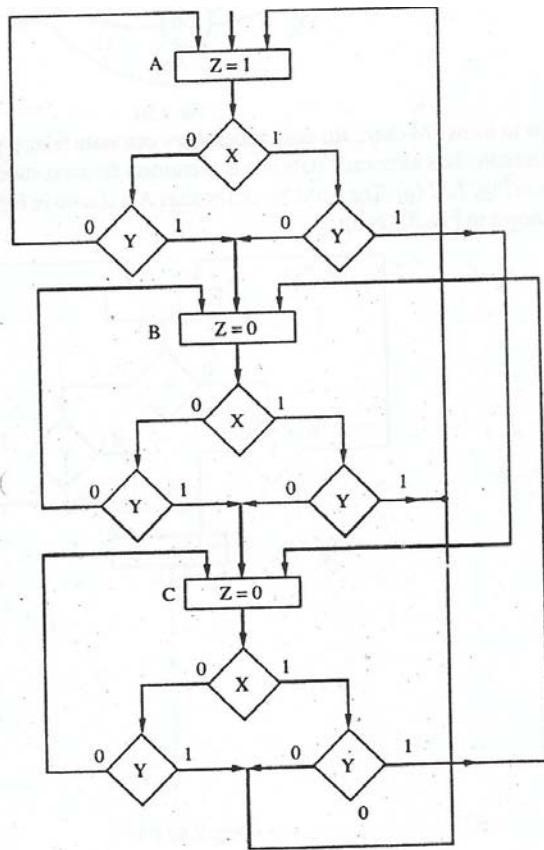
Fig.State Diagram

Solution

Fig.ASM chart