Title: Algorithmic State Machine

Objective:

Design & implement waveform generator circuit using ASM based multiplexer controller method.

Apparatus:

Digital board, GP-4, Patch chords, IC-7474, IC-74153, IC 7432, IC7408, IC7404, Required logic gates if any.

Theory:

1) ASM means algorithmic state machines.
2) It is a type of flowchart that can be used to represent the state transitions & generator outputs for finite state machines (FSM).
3) ASM charts are similar to traditional flowcharts.
4) Unlike traditional flowcharts, this includes timing information. This chart specifies that the FSM flows from one state to another only after each active clock edge

Basic elements of ASM chart:

1) State Box
2) Decision Box
3) Conditional Output Box

State Box:

A rectangle represents a state of FSM. It is equivalent to node in state diagram @ row in state table. The name of the state table should be indicated outside the box in left to ↑ corner. Moore type of o/p's are listed inside of the box.

Conditional Output Box:

The oval denotes o/p signals that are of Mealy type. These o/p's depend on the values of state variables & the i/p of FSM. The condition that

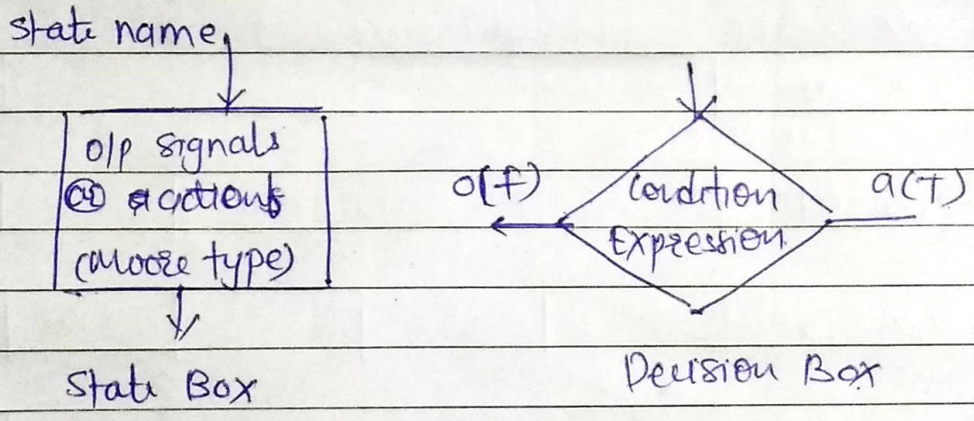
determines whether such o/p's are generated is specified in decision box.

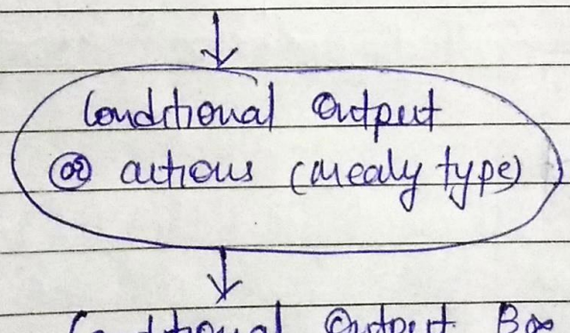
Decision Box:

A diamond indicates that state condition expression has to be tested & an exit plan has to be chosen accordingly. Cond^{n} expression consists of one or many i/p's.

Significance:

It is an aid to design the complex circuits ASM blocks are used to describe complex circuits that include one/more FSM's and another circuitry such as registers, counters, adders, multiplexers etc.





ASM Blocks:

▷ It is a structure which consists of a single state box & any decision & conditional o/p boxes that the state box maybe connected to.

2) It has one path entry & any no. of exit paths.

3) Each block describes the state of system during the

interval of one clock pulse.

Procedure:

▷ Make the connections as per logic circuit of waveform generator circuit & verify its truth table.

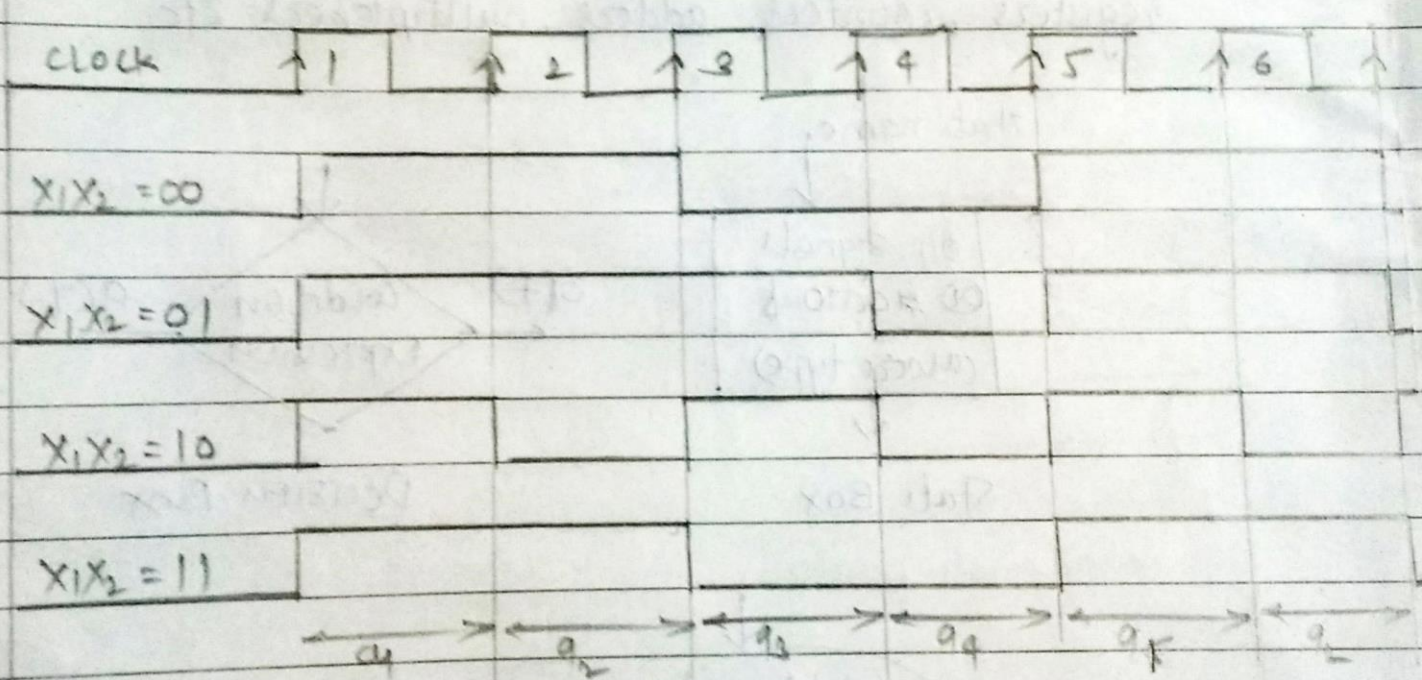
▷ waveform generator using multiplexer controller method

▷ Timing diagram

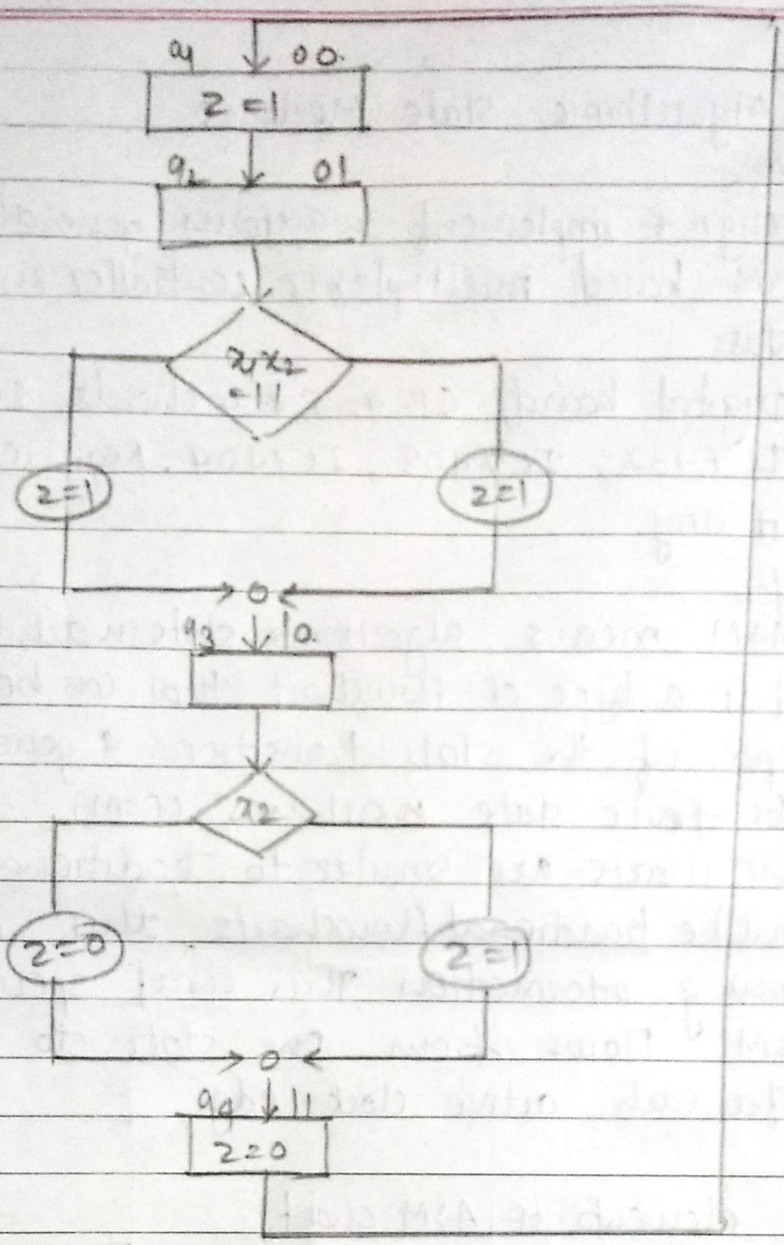
waveform generator has 4 states i.e. 00, 01, 10, 11.

Circuit always goes to next state irrespective of values of x_1, x_2.

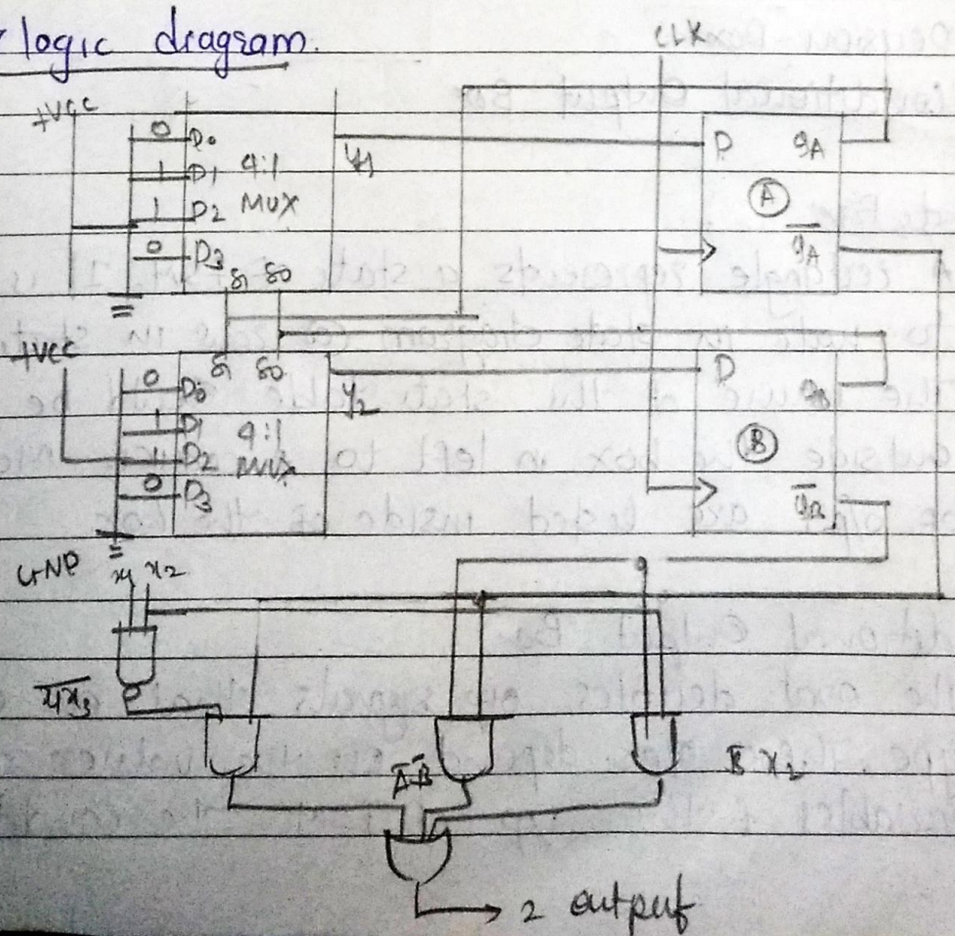
O/p of each state is observed according to I/p combinations of x_1, x_2.



▷ ASM chart:



logic diagram.



logic gates (MSI devices used for implementation)

1) IC 74153 (4:1 MUX) -2
2) IC 7476 - (DUAL - DFF) -1
3) IC 7408 - (AND gate) -1 (4 AND gates req)
4) IC 7432 - (OR gate) - 1 (1 OR gate req)
5) IC 7404 - (NOT gate) -1 (1 NOT gate req)

Applications

Used to apply specified analog signals to circuits anything from DC signals, sine wave of varying frequencies. AM/FM modulated signals.

Conclusion:

Hence ASM by multiplexer controller method are understood, designed & implemented successfully.