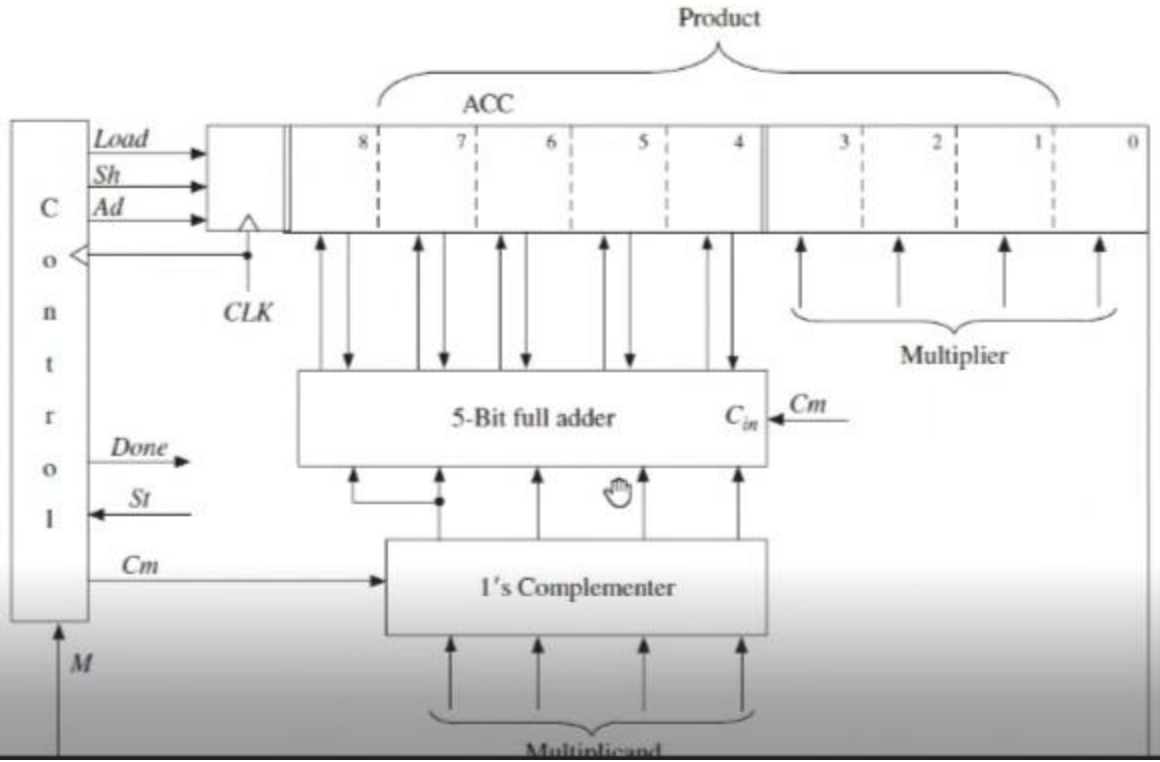
0.1 1 1	(+7/8)	←	Multiplicand
× 0.1 0 1	(+5/8)	←	Multiplier
(0. 0 0)0 1 1 1	(+7/64)	←	*Note*: The proper representation of the
(0.)0 1 1 1	(+7/16)	←	fractional partial products requires extension
0. 1 0 0 0 1 1	(+35/64)		of the sign bit past the binary point, as indicated in parentheses. (Such extension is not necessary in the hardware.)

When the multiplicand is negative and the multiplier is positive, the procedure is the same as in the previous case, except that we must extend the sign bit of the multiplicand so that the partial products and final product will have the proper negative sign. For example,

1.1 0 1	(−3/8)		
× 0.1 0 1	(+5/8)		
(1. 1 1)1 1 0 1	(−3/64)	←	*Note*: The extension of the
(1.)1 1 0 1	(−3/16)	←	sign bit provides proper representation of the
1. 1 1 0 0 0 1	(−15/64)		negative products.

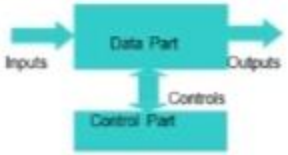
we are doing 2's complement addition. *Cm* causes the multiplicand (Mcand) to be complemented (1's complement) before it enters the adder inputs. *Cm* is also connected to the carry input of the adder so that when *Cm* = 1, the adder adds 1 plus the 1's complement of Mcand to the accumulator, which is equivalent to adding the

FIGURE 4-31: Block Diagram for 2's Complement Multiplier

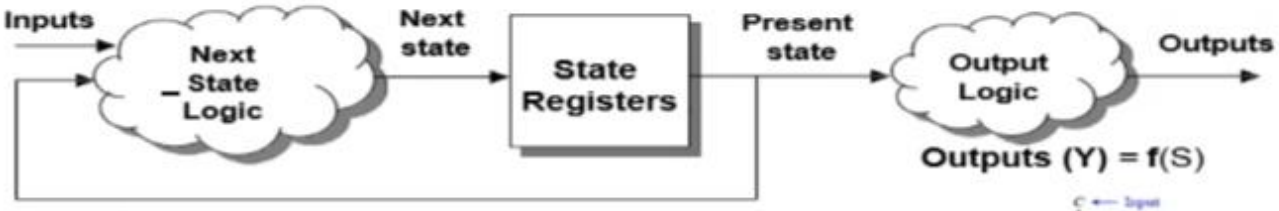


Need of FSM

- Any digital design consists of two parts:
  - Data part :
    - Responsible for the processing of data.
    - The processing is done through some blocks such as (full adder, digital filter, decoder,…)
  - Control part
    - Describes how and when these blocks will communicate with each other.
  - Control part is generally described using a FSM(Finite State Machine).



Moore state Machine

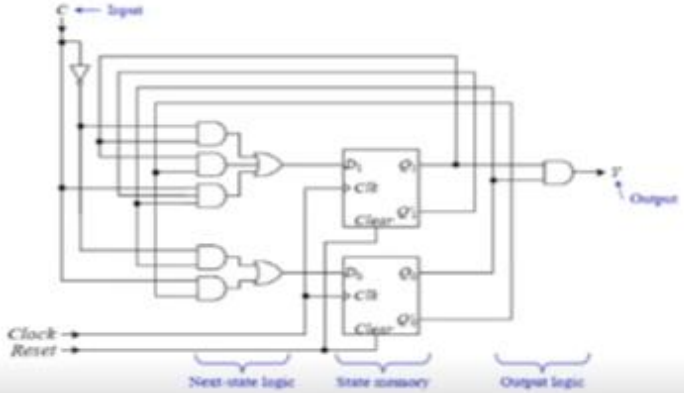


Features:

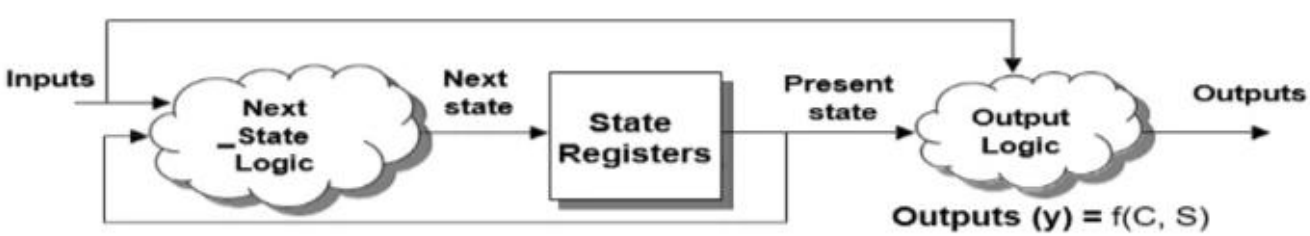
- State machine outputs are dependent only on the present state
- Output vector (Y) is function of the state vector (S)
- Outputs don't react immediately to input change.

Advantage:

- Moore machines effectively filter out transients.
- It can be used to eliminate race conditions when inputs are unfiltered.

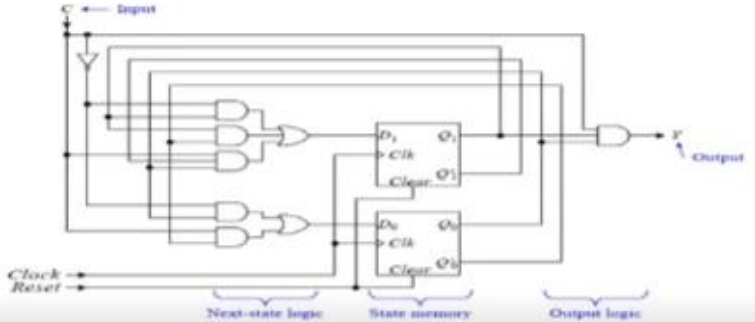


Mealy State Machine



Features:

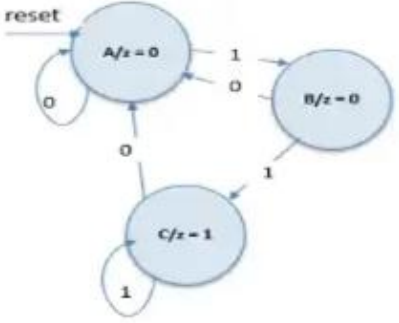
- State machine outputs are dependent **on the inputs and the present state**
- output vector (Y) is function of the state vector (S) and the input (C)
- Outputs react immediately to input changes.
- Mealy machines are used to create control blocks that respond quickly to external signal changes.
- Care must be taken to isolate the design from transients and race conditions



Sequence-11

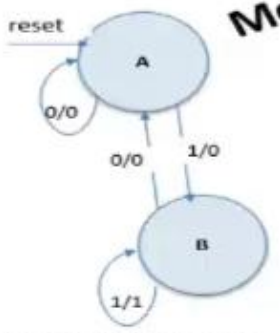
Moore

Sequence detector for 11 - Outputs, state diagram



reset	input	current state	next state	Output (z)
1	–	–	A	
0	0	A	A	0
0	1	A	B	0
0	0	B	A	0
0	1	B	C	1
0	0	C	A	0

Mealy



reset	input	current state	next state	Output (z)
1	–	–	A	
0	0	A	A	0
0	1	A	B	0
0	0	B	A	0
0	1	B	B	1