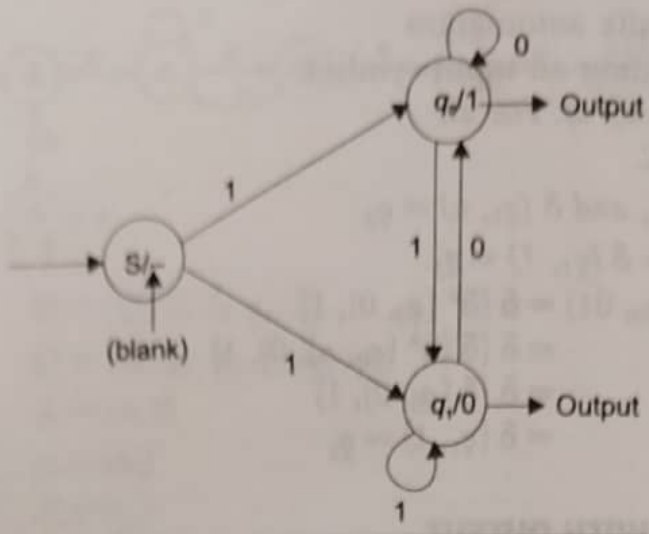
Example *Design a Moore M/C to get 1's complement of given a binary number.*

Answer



Q \ Σ	0	1	o/p
S	q_0	q_1	–
q_0	q_0	q_1	1
q_1	q_0	q_1	0

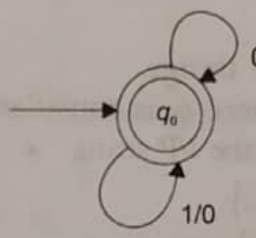
$q_0 : 0 \rightarrow 1$
$q_1 : 1 \rightarrow 0$

(∵ Every state is associated with it's $0/p$)

Note: (*i*) States give output in Moore machine.
(*ii*) Input is associated with output in Mealy machine.

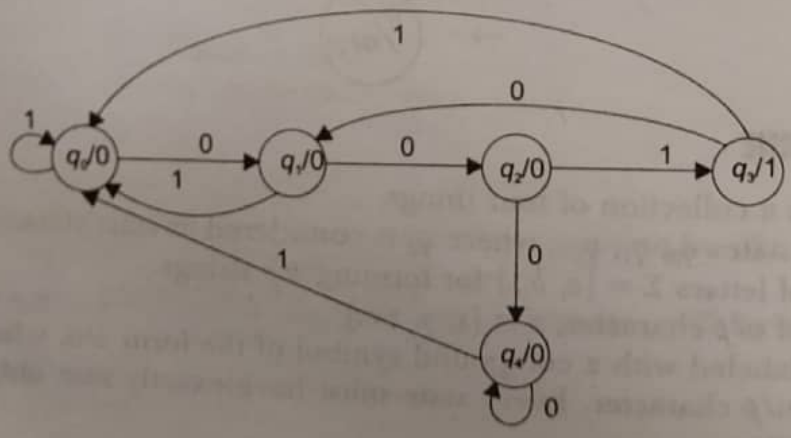
Example *Design the Mealy machine to get 1st complement of the given binary number.*

Answer



Example *Design a Moore machine that gives an output '1' if input of binary sequence a '1' is preceded by exactly two zero's.*

Answer We should check the sequence of two zero's followed by '1' *i.e.*, for 001 output is '1' but for 0001 output is zero.



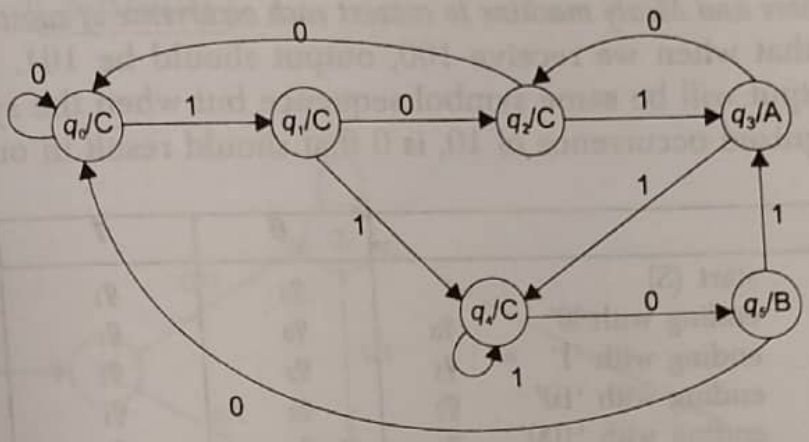
The state q_1 recognizes that only previous symbol is '0', q_2 recognizes only previous two mbols are '0' thus when in state q_2 machine encounters '1' it goes to state q_3 giving output '1', erwise output is zero.

xample *Design a Moore and Mealy machine for a binary input sequence , if it ends in 101, output is ', if it ends in '110' output is B, otherwise 'C'.*

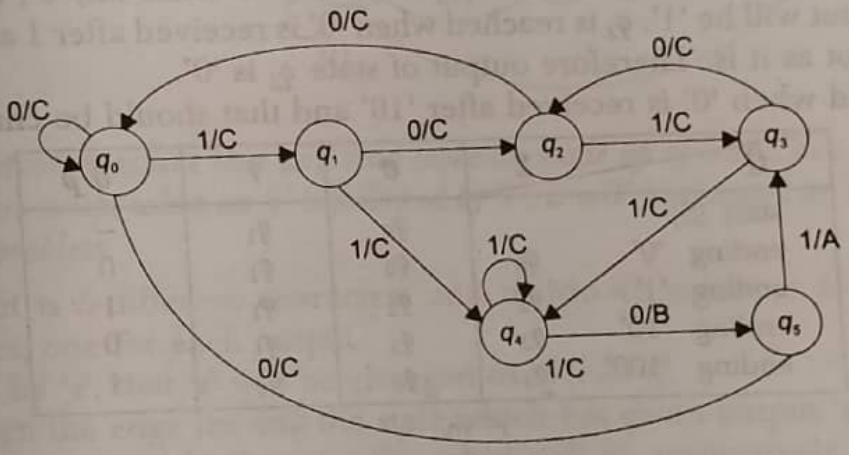
nswer

Q / Σ	0	1	o/p
end with '0' q_0	q_0	q_1	C
end with '1' q_1	q_2	q_4	C
end with '10' q_2	q_0	q_3	C
end with '101' q_3	q_2	q_4	A
end with '11' q_4	q_5	q_4	C
end with '110' q_5	q_0	q_3	B

Moore Machine:



Mealy Machine :

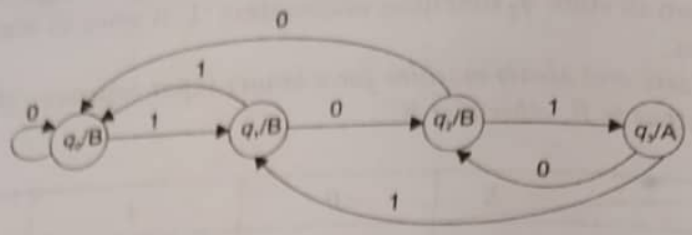


H.T

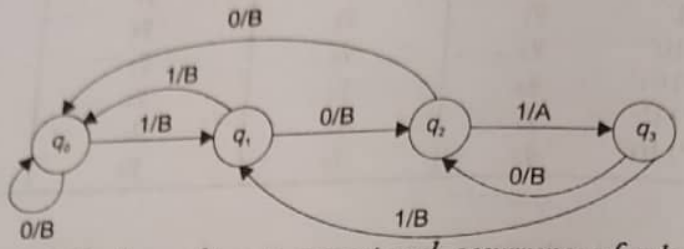
Example *Design a Moore machine and Mealy machine for binary input sequence, output 'A' if '101' is recognized otherwise output 'B'.*

Q / Σ	0	1	o/p
end '0' q_0	q_0	q_1	B
end '1' q_1	q_2	q_0	B
end '10' q_2	q_0	q_3	B
end '101' q_3	q_2	q_1	A

Moore Machine :



Mealy Machine :



Example *Design Moore and Mealy machine to convert each occurrence of substring 100 by 101.*

Answer It means that when we receive 100, output should be 101. Hence till we get the occurrence of 10, output will be same symbol sequence but when the symbol received at the state which has recognized occurrence of 10, is 0 that should result in output '1'.

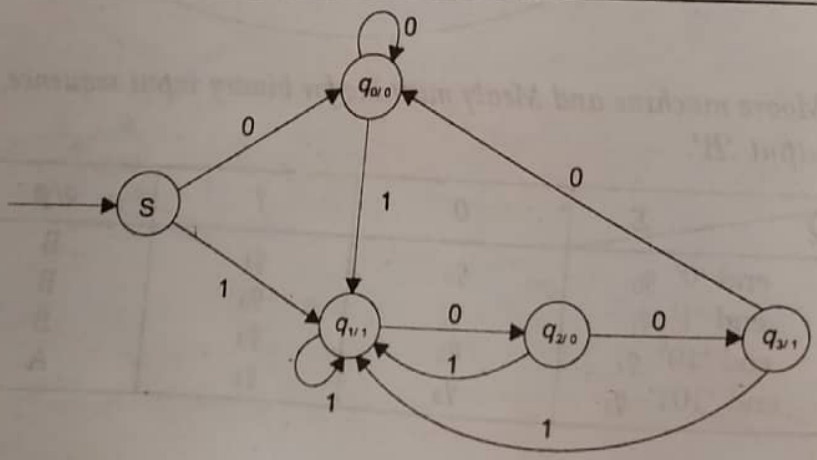
Moore Machine :

		0	1
start (S)		q_0	q_1
ending with '0'	q_0	q_0	q_1
ending with '1'	q_1	q_2	q_1
ending with '10'	q_2	q_3	q_1
ending with '100'	q_3	q_0	q_1

Now q_0 is reached on receiving '0' and output should be same *i.e.*, '0', q_1 state is reached on iving1 and output will be '1'. q_2 is reached when '0' is received after 1 and we know that this It should be kept as it is. Therefore output of state q_2 is '0'.

ow q_3 is reached when '0' is received after '10' and that should be changed to '1'.

Q \ Σ		0	1	0/p
start (S)		q_0	q_1	–
ending '0'	q_0	q_0	q_1	0
ending '1'	q_1	q_2	q_1	1
ending '10'	q_2	q_3	q_1	0
ending '100'	q_3	q_0	q_1	1



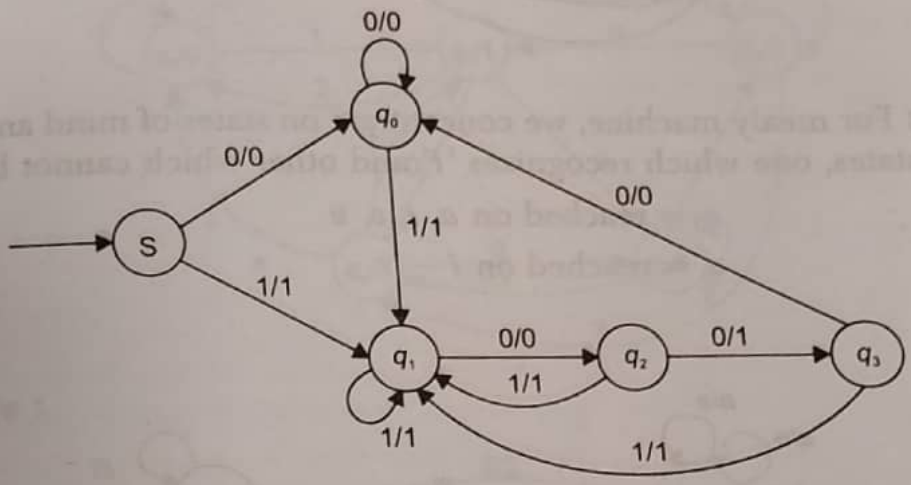
Moore-Machine

Suppose input string is 11010001, then

S 11010001
q_1 11010001 $\Rightarrow$ $0/p \rightarrow$ – (dash)
1 q_1 1010001 $\Rightarrow$ $0/p \rightarrow 1$
11 q_1 010001 $\Rightarrow$ $0/p \rightarrow 1$
110 q_2 10001 $\Rightarrow$ $0/p \rightarrow 0$
1101 q_1 0001 $\Rightarrow$ $0/p \rightarrow 1$
11010 q_2 001 $\Rightarrow$ $0/p \rightarrow 0$
110100 q_3 01 $\Rightarrow$ $0/p \rightarrow 1$
1101000 q_0 1 $\Rightarrow$ $0/p \rightarrow 0$
11010001 q_1 $\Rightarrow$ $0/p \rightarrow 1$

The output sequence is : 11010101

Mealy Machine :



Example *Design a Moore machine that will read sequence made up of letters a, e, i, o, u and will give as output same characters except when an 'i' is followed by 'e', it will be changed to 'u'. Also design Mealy machine for the above problem.*

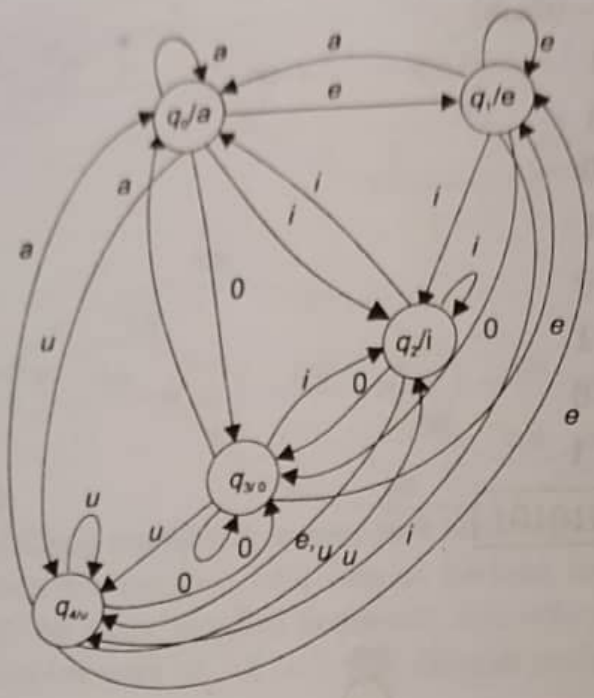
Answer The output is 5-different characters and in Moore machine as state gives output there will be '5' states, one for each output.

When '*i*' is followed by '*e*', that '*e*' will be changed to '*u*'($i \rightarrow e$).

Hence in the design the edge leaving the state which has given output '*i*' should go to state given output '*u*' on receiving '*e*' otherwise the edges will go respectively to the states which result in same output as that of output.

Q \ Σ	*a*	*e*	*i*	*o*	*u*	*0/p*
(*a*) q_0	q_0	q_1	q_2	q_3	q_4	*a*
(*e*) q_1	q_0	q_1	q_2	q_3	q_4	*e*
(*i*) q_2	q_0	q_4	q_2	q_3	q_4	*i*
(*o*) q_3	q_0	q_1	q_2	q_3	q_4	*o*
(*u*) q_4	q_0	q_1	q_2	q_3	q_4	*u*

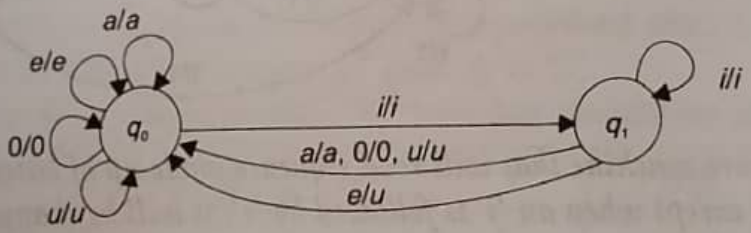
Moore Machine :



Mealy Machine: For mealy machine, we concentrate on states of mind and we find that there will be only two states, one which recognizes '*i*' and other which cannot be reached on '*i*'.

Let, q_0 = reached on *a*, *e*, *o*, *u*

q_1 = reached on *i*



Example *Design Moore and Mealy machine for input from (0 + 1 + 2)* print the residue module of '5' of the input treating it as ternary (base 3, with digits 0, 1, 2) number.*

Answer The output as the remainder whether number is divided by '5', there will be '5' different output symbols and hence 5 states will be needed in Moore Machine. As the number has base '3', it will contain only '3' symbols 0, 1, 2.

Hence if given number is 1202 then its value will be

$$1 \times 3^3 + 2 \times 3^2 + 0 \times 3^1 + 2 \times 3^0$$

$$= 27 + 18 + 0 + 2$$

$$= 47$$

Hence every time we get a new digit while scanning the input from left to right the previous mainder will be multiplied by '3' and new digit will be added to again find the remainder. emainder = ((previous remainder × base) + digit) % 5

State Table

Q \ Σ	0	1	2	o/p
remainder '0' q_0	q_0	q_1	q_2	0
remainder '1' q_1	q_3	q_4	q_0	1
remainder '2' q_2	q_1	q_2	q_3	2
remainder '3' q_3	q_4	q_0	q_1	3
remainder '4' q_4	q_2	q_3	q_4	4

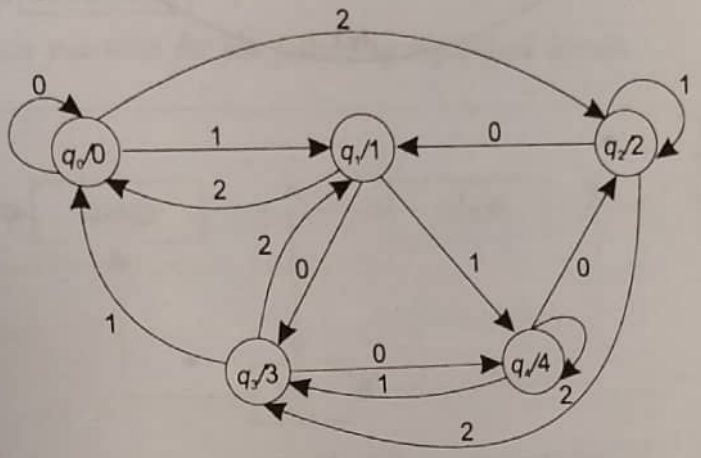
r state q_1 :

Input '0' $1 \times 3 + 0 = 3 = q_3$

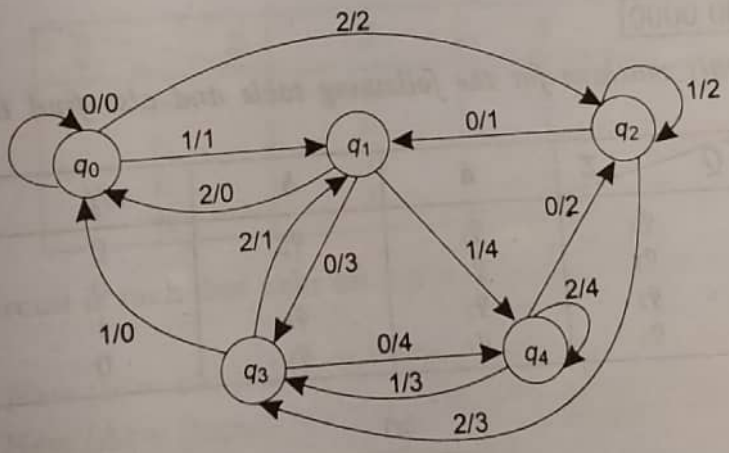
Input '1' $1 \times 3 + 1 = 4 = q_4$

Input '2' $1 \times 3 + 2 = 5 = q_0$ ($\because$ remainder = 0)

oore Machine :



lealy Machine :

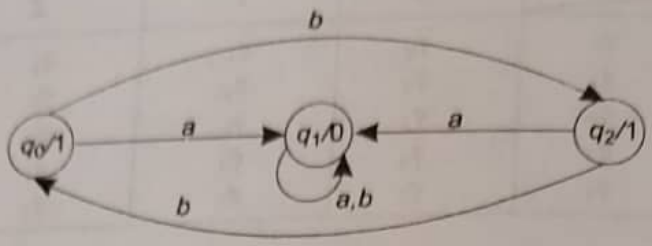


Example *Design Mealy machine for the following table and also find the output for the string "abba baaa".*

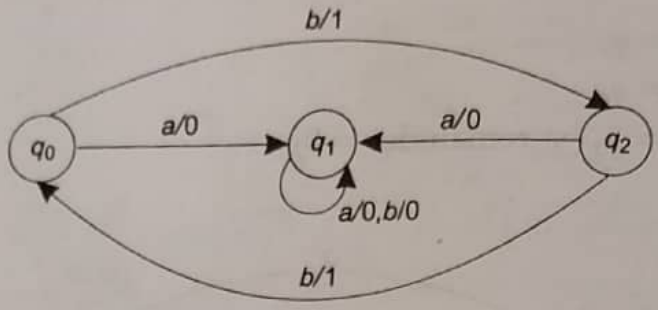
Q \ Σ	a	b	o/p
q_0	q_1	q_2	1
q_1	q_1	q_1	0
q_2	q_1	q_0	1

Answer

Moore Machine :



Mealy Machine :



$\underline{q_0}$ *abbabaaa* I/P

a $\underline{q_1}$ *bbabaaa* $0/p \rightarrow 0$

ab $\underline{q_1}$ *babaaa* $0/p \rightarrow 0$

abb $\underline{q_1}$ *abaaa* $0/p \rightarrow 0$

abba $\underline{q_1}$ *baaa* $0/p \rightarrow 0$

abbab $\underline{q_1}$ *aaa* $0/p \rightarrow 0$

abbaba $\underline{q_1}$ *aa* $0/p \rightarrow 0$

abbabaa $\underline{q_1}$ *a* $0/p \rightarrow 0$

abbabaaa $\underline{q_1}$ $0/p \rightarrow 0$

o/p sequence is 0000 0000

Example *Design Mealy machine for the following table and also find the output for the strin "abbabaaa".*

Q / Σ	a	b	o/p
q_0	q_3	q_2	0
q_1	q_1	q_0	0
q_2	q_2	q_3	1
q_3	q_3	q_1	0