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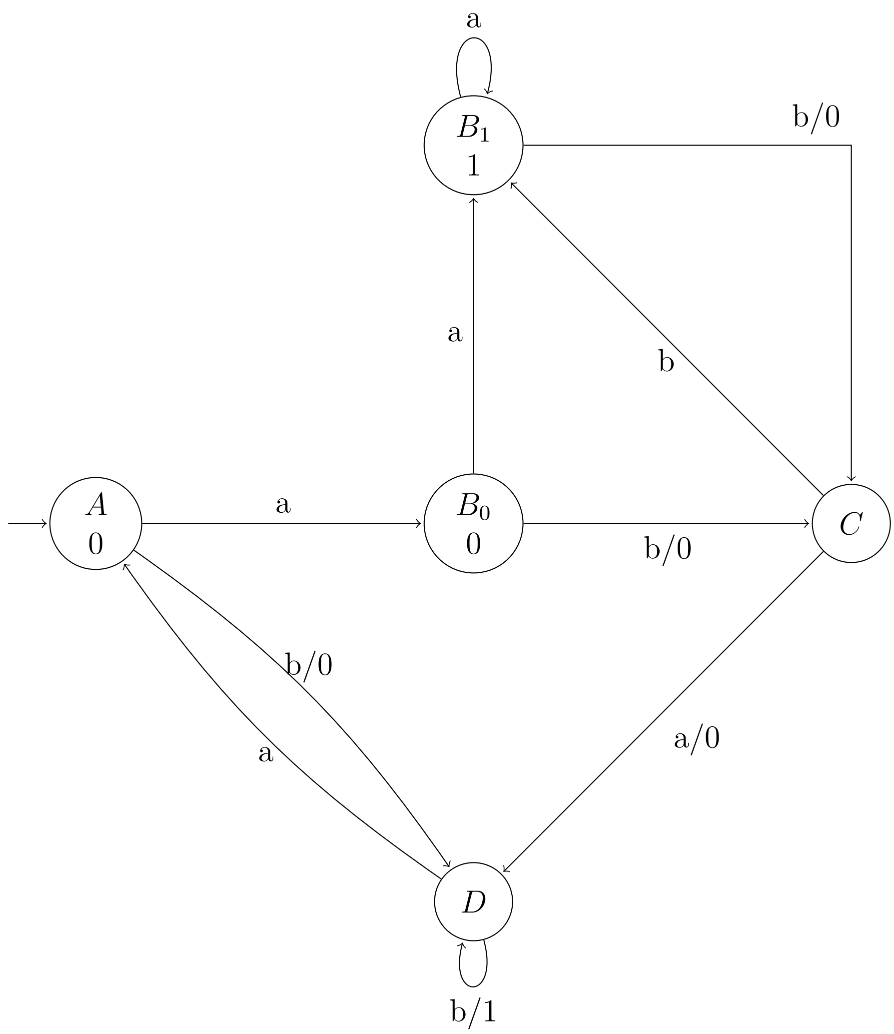
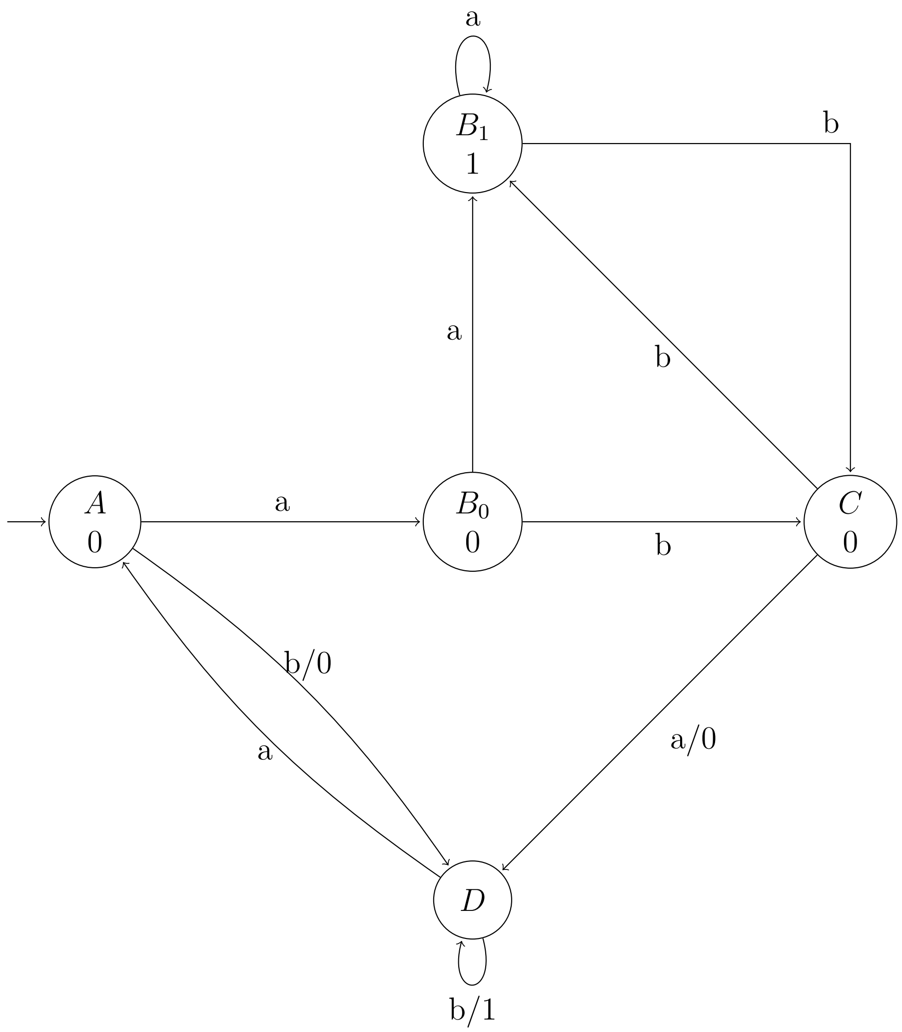
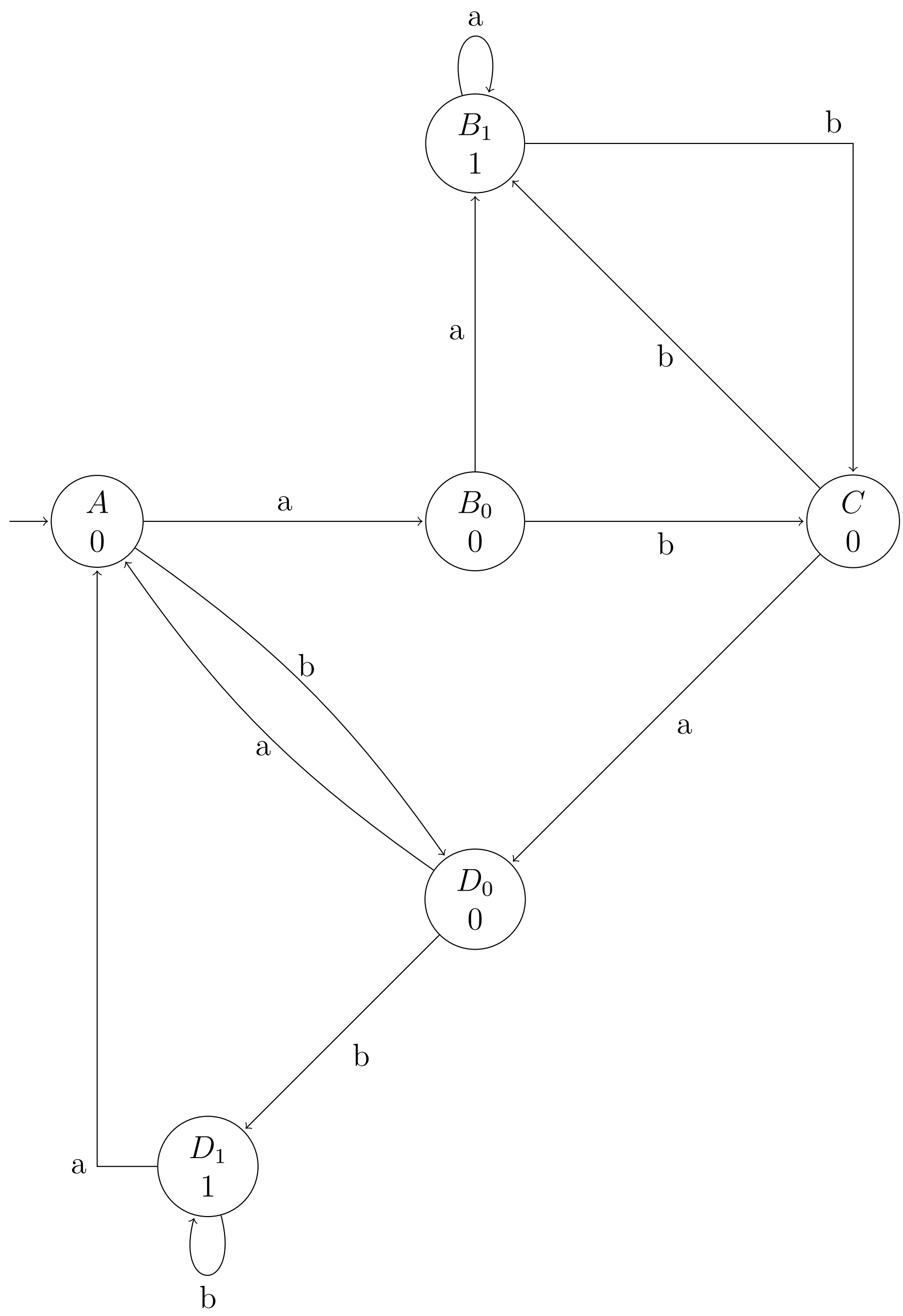


For the state A, the incoming edges to this state are from B_0 to C with label $b/0$ andB_1 to C with label $b/0$. There is no difference in the outputs of the incoming edges to this state, and so in the constructing Moore machine the output for this state will be 0.



For the state D, the incoming edges are A to D with label $b/0$, from C to D with label $a/0$, and from D to D with label $b/1$.
We get two different outputs for two incoming edges (D to D output 1, C to D output 0).
So, the state D will be divided into two, namely, D_0 and D_1. The outgoing edges are duplicated for both the states generated from D. The modifi ed machine is



a
B_1
1
b
a
b
A
0
a
B_0
0
C
0
b
b
a
a
D_0
0
b
a
D_1
1
b

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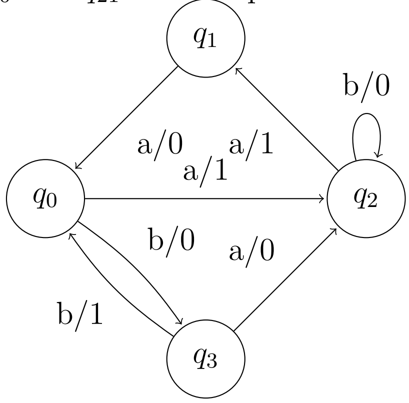
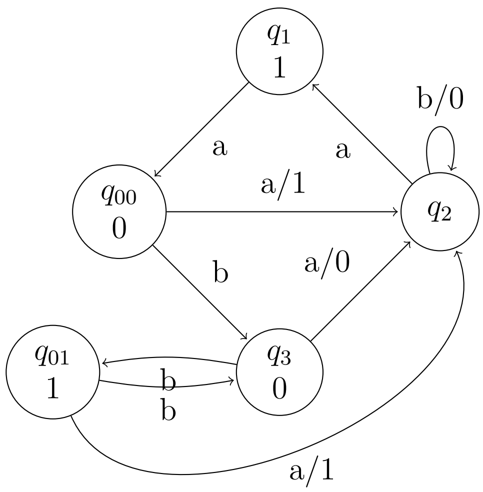
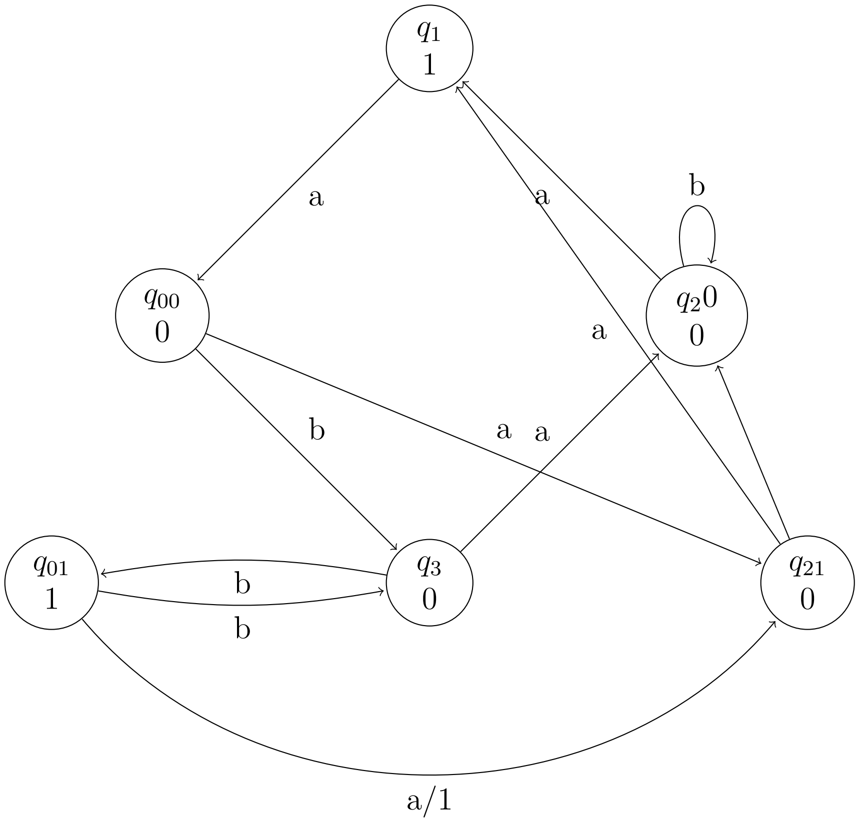
21. Convert the following Mealy machine into an equivalent Moore machine. $[UPTU2004]$.
Solution: The state q_0 has two incoming edges: from q_1 with label $a/0$ and from q_3 with label $b/1$. As there is a difference in output, the state q_0 is divided into q_{00} and q_{01} with outputs 0 and 1, respectively.
The states q_1 and q_3 have only one incoming edge each, and so there is no need of division.
The state q_2 has three incoming edges; among those, two are of output $'0'$ and another is of output $'1'$.
Thus, it is divided into q_{20} and q_{21} with outputs 0 and 1,respectively..



. From q_1 input with label a ends on $q_0 0$, and from q_3 input with label b ends on $q_0 1$. The outputs from old q_1 state are duplicated from $q_0 0$ and $q_0 1$. The state q_1 and q_3 are not divided.
q_1 gets output $'1'$ and q_3 gets output $'0'$. Dividing the state q_0 and placing q_1 and q_3, the intermediate machine becomes as follows..



. The state q_2 is divided into q_{20} and q_{21}. From q_{00} and q_{01} input with label $'a'$ ends on q_{21}. From q_3 input with label $'a'$ ends on q_{20}. There is a loop on q_2. That loop will be on q_{20} with label $'b'$. Another transition with label $'b'$ is drawn from q_{21} to q_{20}. The fi nal Moore machine is as follows..



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22. Minimize the following fi nite automata.

Present State	Next State I/P = a	I/P = b
→A	B	F
B	A	F
C	G	A
D	H	B
E	A	G
F	H	C
G	A	D
H	A	C

Here F, G, and H are the fi nal states.
Solution: In the fi nite automata, the states are $\{A, B, C, D, E, F, G, H\}$. Name this set as S_0.
$S_0 : \{A, B, C, D, E, F, G, H\}$
All of the states are 0 equivalents.
In the fi nite automata, there are two types of states: fi nal state and non-fi nal states. So, divide the set of states into two parts, Q_1 and Q_1.
$Q_1 = \{F, G, H\}$ $\quad$ $Q_2 = \{A, B, C, D, E\}$
$S_1 : \{\{F, G, H\}\{A, B, C, D, E\}\}$
The states belonging to same subset are 1-equivalent because they are in the same set for string length 1. The states belonging to different subsets are 1-distinguishable.
The next states of F are H and C. The next states of G and H are A, D and A, C,

respectively.
A, D and A, C belong to the same subset but H and C belong to a different subset. So, F, G, and H are divided into $\{F\}, \{G, H\}$.
For input 0, the next states of A, B, C, D, and E are B, A, G, H, and A, respectively. For input 1, the next states of A, B, C, D, and E are F, F, A, B, and G, respectively. So, the set A, B, C, D, E is divided into $\{A, B, E\}$ and $\{C, D\}$.
$S_2 : \{\{F\}\{G, H\}\{A, B, E\}\{C, D\}\}$
By the same process, $\{A, B, E\}$ is divided into $\{A, B\}, \{E\}$.
$S_3 : \{\{F\}\{G, H\}\{A, B\}\{E\}\{C, D\}\} = \{\{A, B\}, \{C, D\}, \{E\}, \{F\}, \{G, H\}\}$
The set is not dividable further. So, these are the states of minimized DFA. Let us rename the subsets as q_0, q_1, q_2, q_3, and q_4. The initial state was A, and so here the initial state is A, B, i.e., q_0.
The fi nal state was F, G, and H, and so here the fi nal states are $\{F\}$, i.e., q_3 and $\{G, H\}$, i.e., q_4. The tabular representation of minimized DFA is

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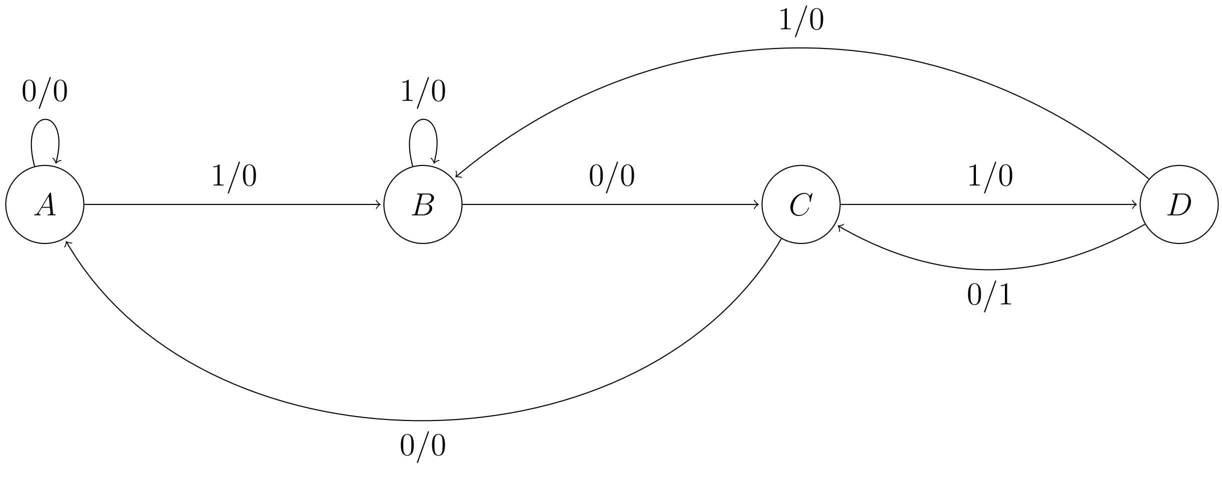
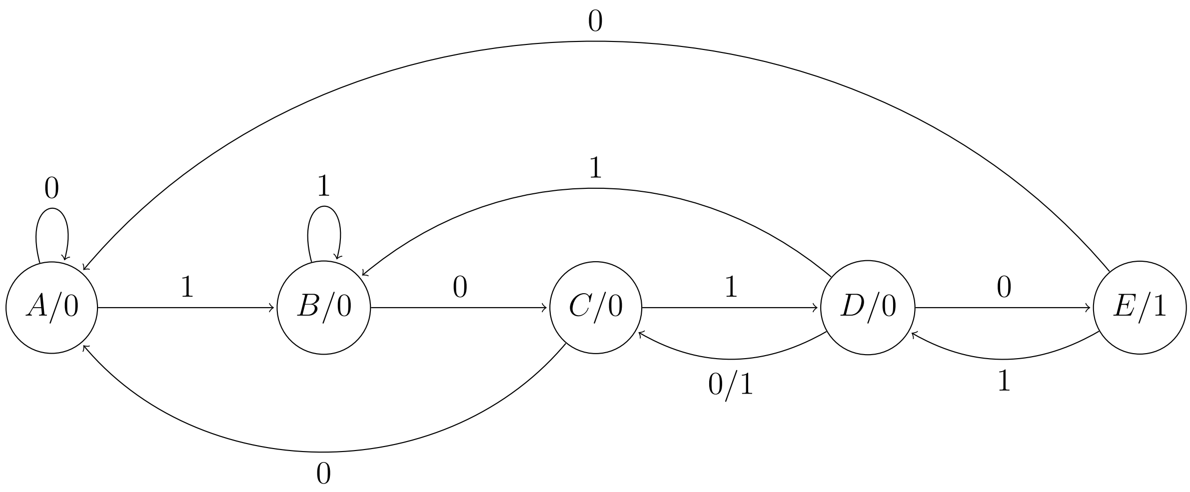
Present State	Next State	
	I/P = 0	I/P = 1
$\rightarrow q_0$	q_0	q_3
q_1	q_4	q_0
q_2	q_0	q_4
q_3	q_4	q_1
q_4	q_0	q_1

23. Design a Mealy and Moore machine for detecting a sequence 1010 where overlapping sequences are also accepted. Convert the Moore machine that you have got into a Mealy machine. Are there any differences? How will you prove that the two Mealy machines are equivalent?

Solution: The Mealy machine is



The Moore machine is



The converted Mealy machine from the given Moore machine is (by using the transactional format)