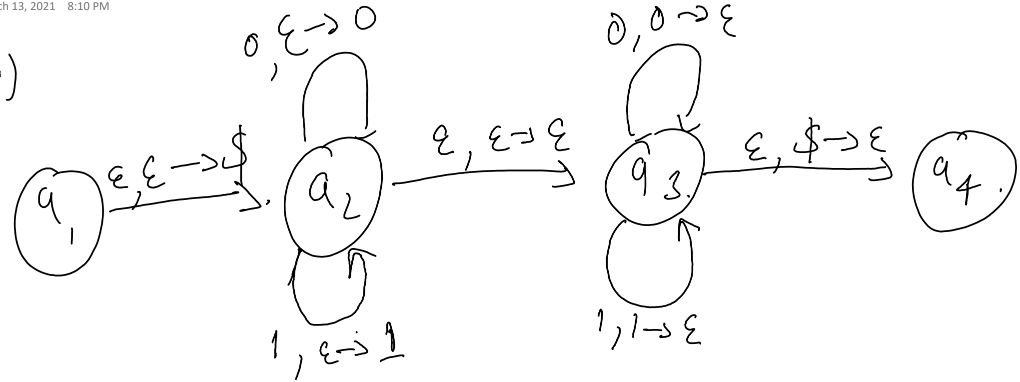
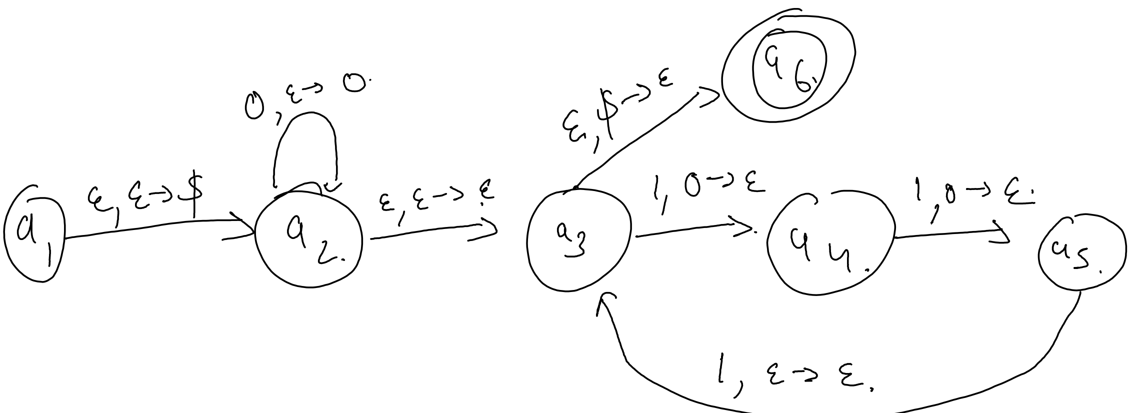
Hw5

Saturday, March 13, 2021 8:10 PM

1.1 a.)



1.1 b.)



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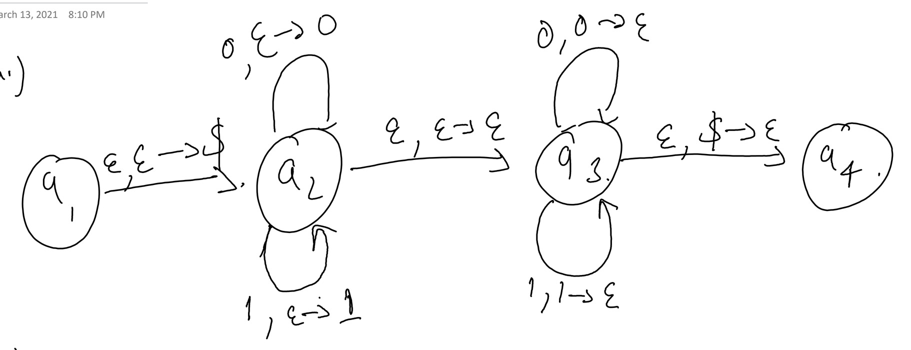
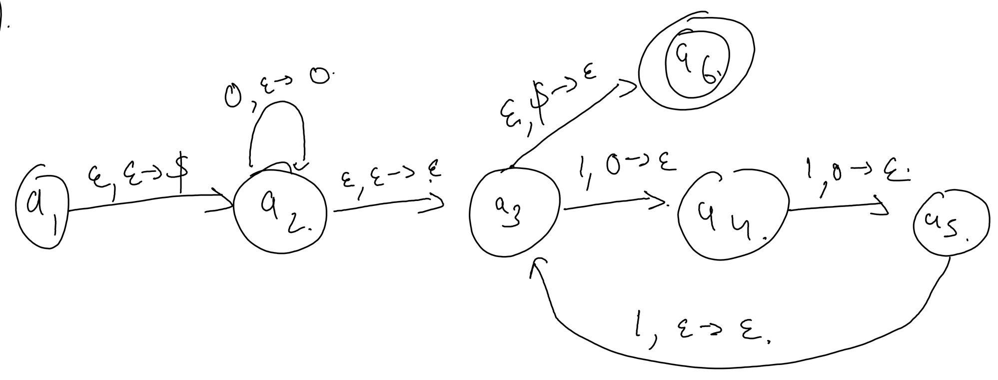
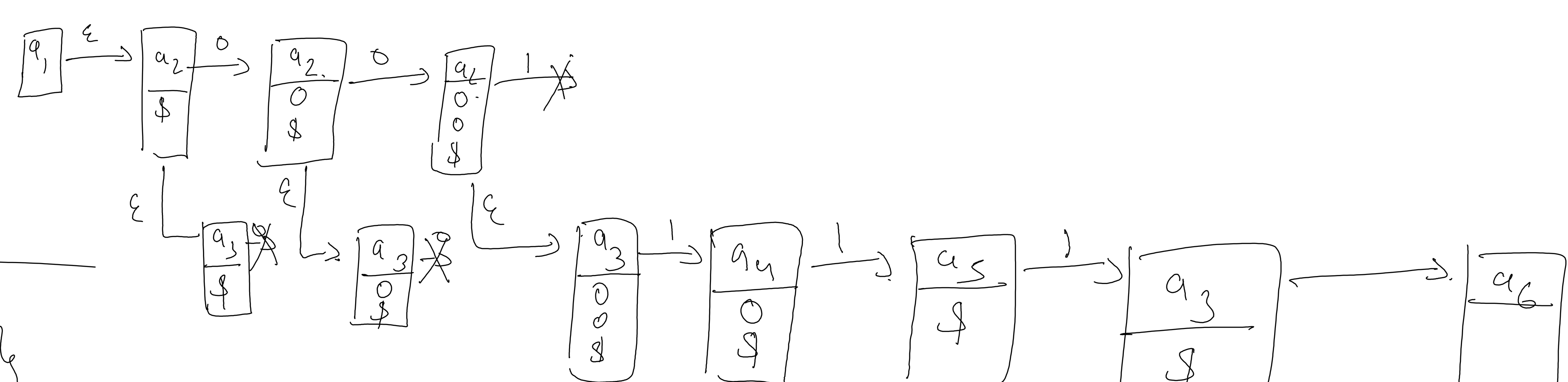


1.1 b.)



ε 00111



Ex 2.)

$L(M_1) = \{ a^{n_1} b^{n_2} c^{n_3} \mid n_1 + n_2 = n_3 \wedge \{n_1, n_2, n_3\} \in P(N) \}$

$L(M_2) = \{ 0^n 1^n \mid n \in N \}$

Ex 3.)

Ans a.)

We know, the terminals of the CFG, formed by the automaton is the same as the input set of the PDA.

So,

$\Sigma = \{0, 1\}$

And, the start variable of the CFG is.

$S = A_{q_0 q_{accept}}$

$= A_{11}$

Now, writing the variables of the CFG,

$V = \{A_{11}, A_{22}, A_{33}, A_{12}, A_{21}, A_{23}, A_{32}, A_{13}, A_{31}\}$

Now, deriving the rules:

$\because \delta(1, \varepsilon, \varepsilon) = (2, \$)$ and $\delta(3, \varepsilon, \$) = (1, \varepsilon)$

$\therefore A_{11} = \varepsilon A_{23} \varepsilon$

$= A_{23}$

$\because \delta(2, 1, \varepsilon) = (2, 1)$, $\delta(2, 0, 1) = (3, \varepsilon)$ and $\delta(3, 0, 1) = (3, \varepsilon)$

$A_{23} = 1 A_{22} 0 \mid 1 A_{23} 0$

Now, using the third and the second parts of the lemma to derive further rules

the number of rules that can be derived from the second condition is.

Since the number of rules is large, we leave it just like it is as

$A_{pq} = A_{pr} A_{rq}$ [for $p, q, r \in \{1, 2, 3\}$]

The rules derived from the second condition are:

$A_{11} = \varepsilon \quad A_{22} = \varepsilon \quad A_{33} = \varepsilon$

$\therefore$ The CFG generated is given by

$V = \{A_{11}, A_{22}, A_{33}, A_{12}, A_{21}, A_{23}, A_{32}, A_{13}, A_{31}\}$

$\Sigma = \{0, 1\}$

$S = A_{11}$

$R =$

$A_{11} = A_{23} \mid \varepsilon$

$A_{23} = 1 A_{22} 0 \mid 1 A_{23} 0$

$A_{pq} = A_{pr} A_{rq}$ [for $p, q, r \in \{1, 2, 3\}$]

$A_{22} = \varepsilon$

$A_{33} = \varepsilon$

Ans b.)

So,

$S = A_{11}$

$= A_{11} A_{11}$ [Since $A_{11} = A_{11} A_{11}$ is one of the rules in $A_{pq} = A_{pr} A_{rq}$ for $p, q, r \in \{1, 2, 3\}$, here $p = q = r = 1$]

$= A_{23} A_{23}$

$= 1 A_{23} 0 \; 1 A_{23} 0$

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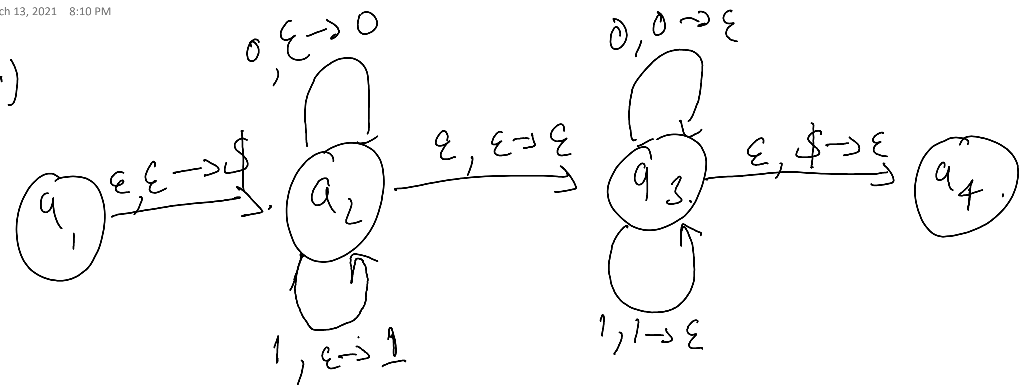
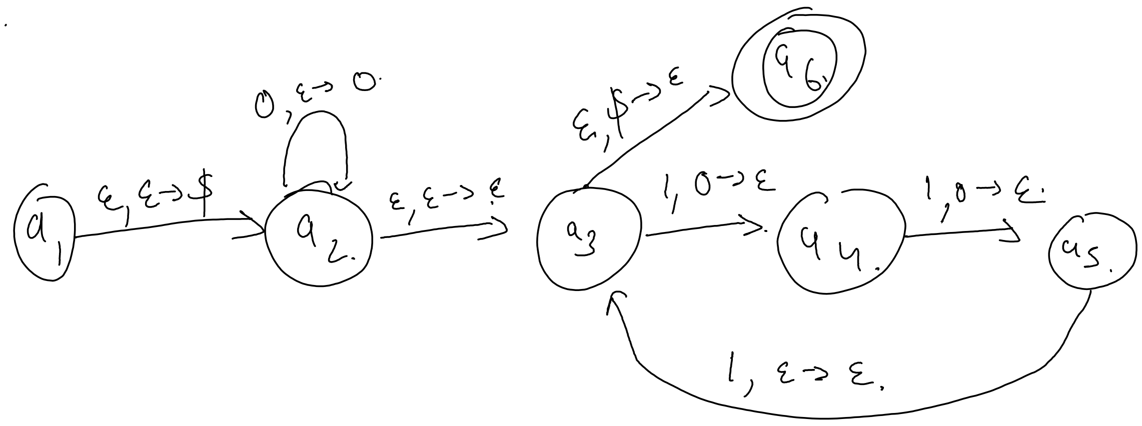
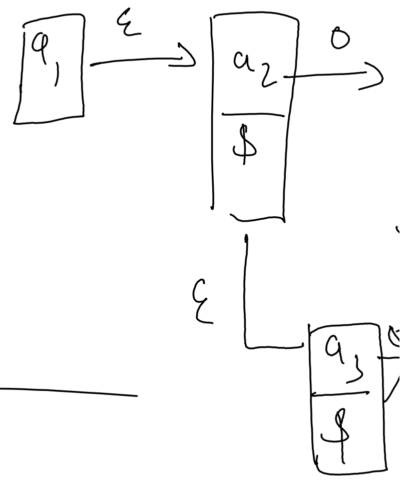
1.1 a.)



1.1 b.)



$\varepsilon\,00111$



Ex 2.)

$$L(M_1) = \{ a^{n_1} b^{n_2} c^{n_3} \mid n_1 + n_2 = n_3 \wedge \{n_1, n_2, n_3\} \in P(N) \}$$

$$L(M_2) = \{ 0^n 1^n \mid n \in N \}$$

Ex 3.)

Ans a.)

We know, the terminals of the CFG, formed by the automaton is the same as the input set of the PDA.

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$$\Sigma = \{0, 1\}$$

And, the start variable of the CFG is.

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$$= A_{11}$$

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Now, deriving the rules:

$\because \delta(1, \varepsilon, \varepsilon) = (2, \$)$ and $\delta(3, \varepsilon, \$) = (1, \varepsilon)$

$$A_{11} = \varepsilon A_{23} \varepsilon$$

$$= A_{23}$$

$\because \delta(2, 1, \varepsilon) = (2, 1)$, $\delta(2, 0, 1) = (3, \varepsilon)$ and $\delta(3, 0, 1) = (3, \varepsilon)$

$$A_{23} = 1 A_{22} 0 \mid 1 A_{23} 0$$

Now, using the third and the second parts of the [illegible]
to derive further rules.
Since the number of rules that can be derived from the
large, we leave it just like it is as

$A_{pq} = A_{pr} A_{rq}$ [for $p, q, r \in \{1, 2, 3\}$]

The rules derived from the second condition are:

$A_{11} = \varepsilon$ $A_{22} = \varepsilon$ $A_{33} = \varepsilon$

$\therefore$ The CFG generated is given by.

$V = \{A_{11}, A_{22}, A_{33}, A_{12}, A_{21}, A_{23}, A_{32}, A_{13}, A_{31}\}$.

$\Sigma = \{0, 1\}$

$S = A_{11}$

$R =$

$A_{11} = A_{23} \mid \varepsilon$

$A_{23} = 1 A_{22} 0 \mid 1 A_{23} 0$.

$A_{pq} = A_{pr} A_{rq}$ [for $p, q, r \in \{1, 2, 3\}$].

$A_{22} = \varepsilon$

$A_{33} = \varepsilon$

Ans b.)

So,

$S = A_{11}$

$= A_{11} A_{11}$ [Since $A_{11} = A_{11} A_{11}$ is one of the rules, he[illegible] $A_{pq} = A_{pr} A_{rq}$ for $p, q, r \in \{1, 2, 3\}$, $p = q = r = 1$].

$= A_{23} A_{23}$

$= 1 A_{23} 0 \ 1 A_{23} 0$

$= 11 A_{22} 00 \ 11 A_{23} 00$

$= 11 \varepsilon 00 \ 111 A_{22} 000$

$= 11001112000$

$= 1100111000$