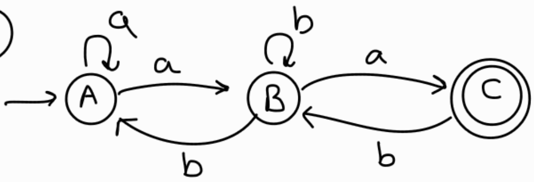
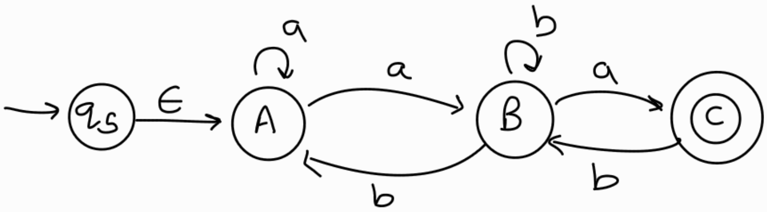
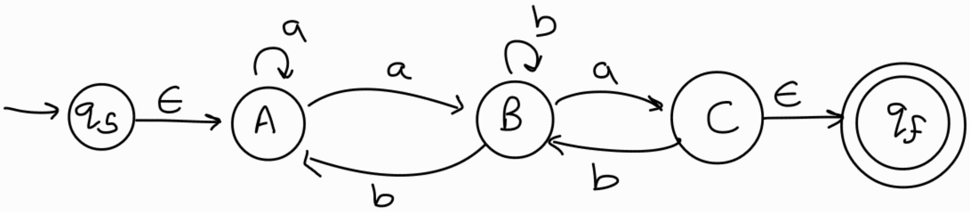
8/05/23

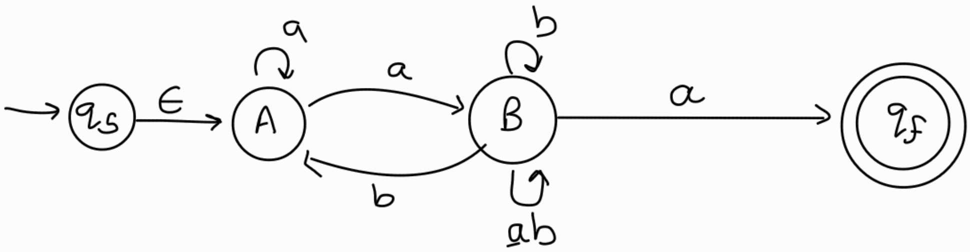
Regular expression using state elimination.

1

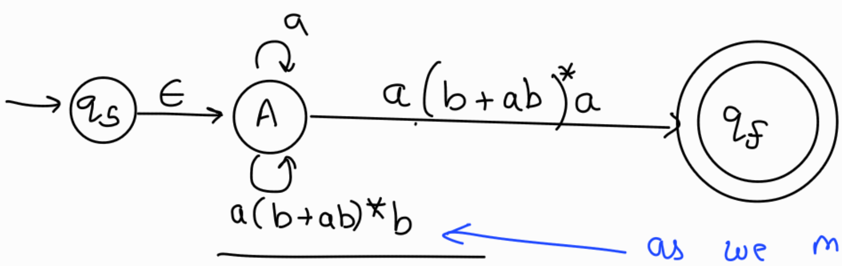




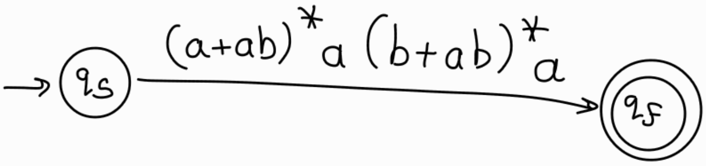




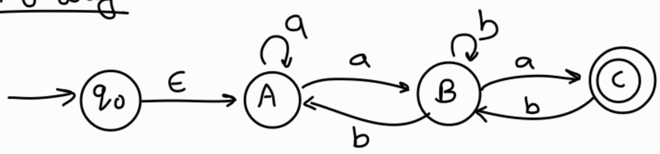
// elim state C.

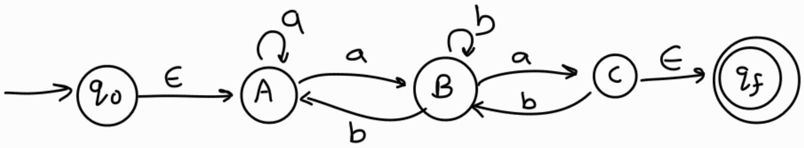


as we might go to B have the loops * times and go back to A.

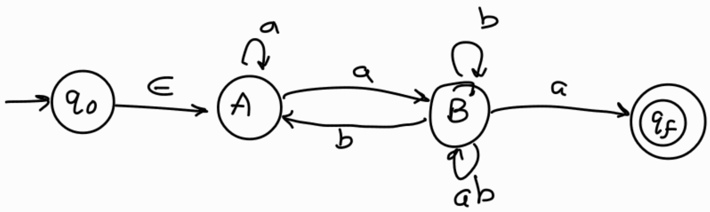


Ma'am's way

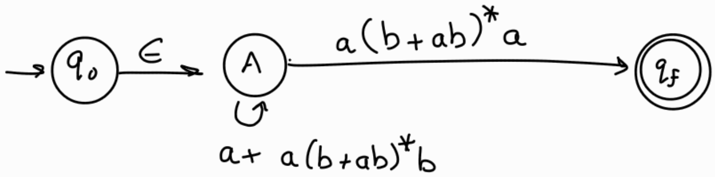




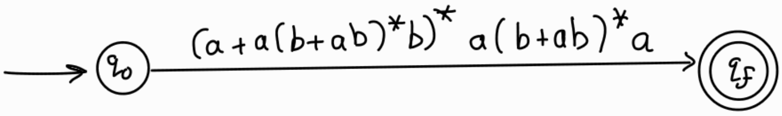
Eliminate C :



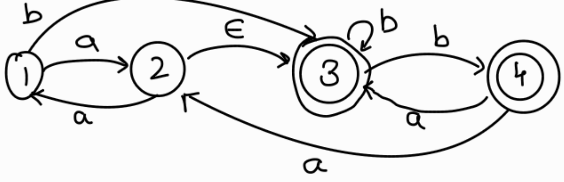
Elim B :



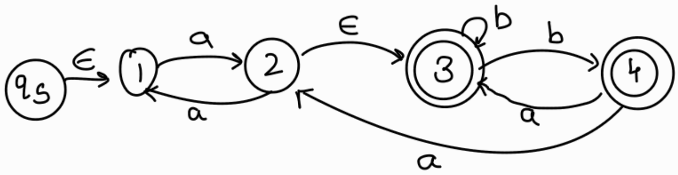
Elim A :

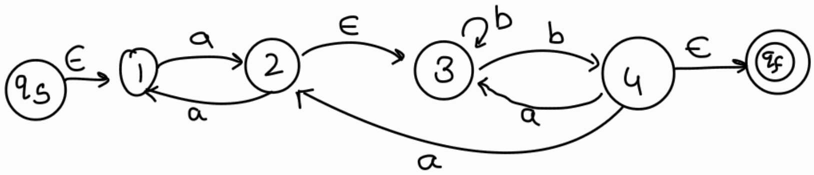


2

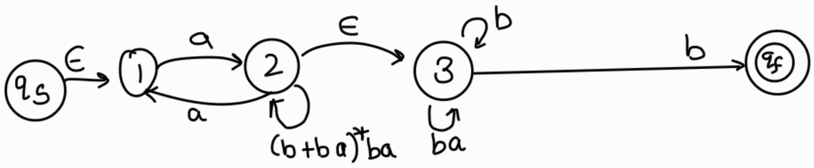


Solved at the end

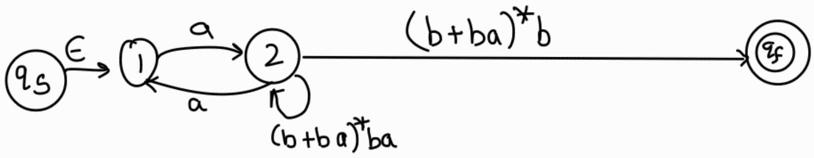




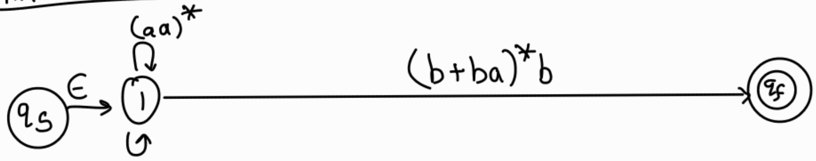
Eliminate 4 :



Eliminate 3

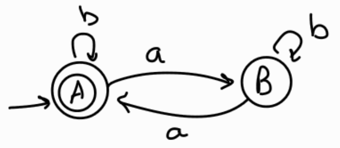


Eliminate 2 :



$b + a(aa)^* b^* + (b + (b + a(aa)^* b^* b (a + a(aa)^* b^* b)^* (\epsilon + (a + a(aa)^* b^*)$

① Find RE using Arden's theorem:



$A = \epsilon + Ab + Ba$

$B = Aa + Bb$

$B = Aab^* \quad \ldots ①$

$A = \epsilon + Ab + Ba$

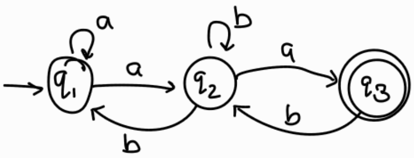
$= \epsilon + Ab + Aab^*a$

$A = \epsilon + A(b + ab^*a)$

$A = \epsilon(b + ab^*a)^*$

$\therefore$ Regex $= (b + ab^*a)^*$

②



$q_1 = \epsilon + q_1a + q_2b$

$q_2 = q_1a + q_2b + q_3b$

$q_3 = q_2a$

$q_2 = q_1a + q_2b + q_2ab$

$q_2 = q_1a + q_2(b + ab)$

$q_2 = q_1a(b + ab)^*$

$q_1 = \epsilon + q_1a + q_1a(b + ab)^*b$

$q_1 = \epsilon + q_1(a + a(b + ab)^*b)$

$q_1 = \epsilon(a + a(b + ab)^*b)^*$

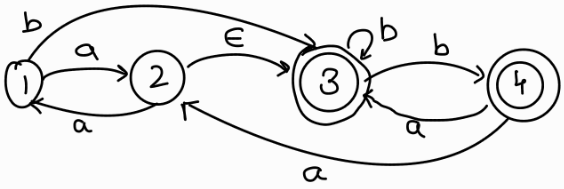
$q_1 = (a + a(b + ab)^*b)^*$

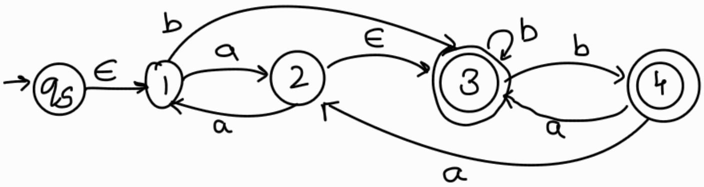
$q_2 = q_1a(b + ab)^*$

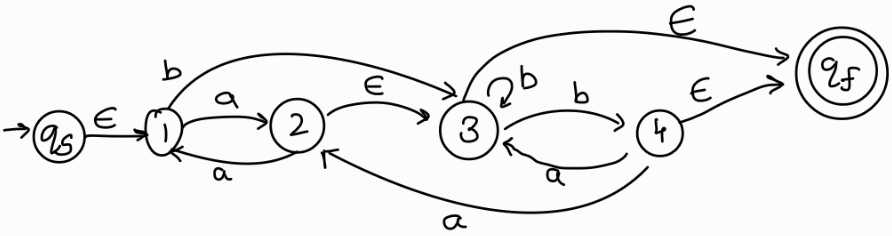
$q_2 = (a + a(b + ab)^*b)^*a(b + ab)^*$

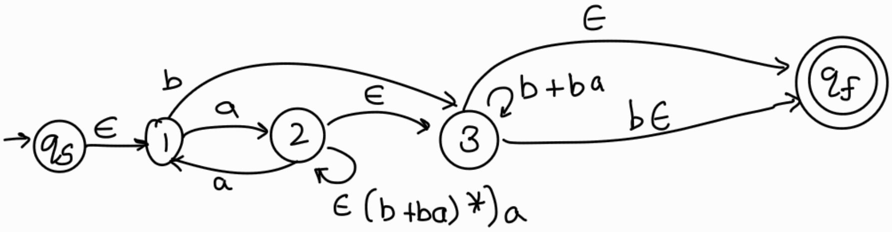
$q_3 = (a + a(b + ab)^*b)^*a(b + ab)^*a$

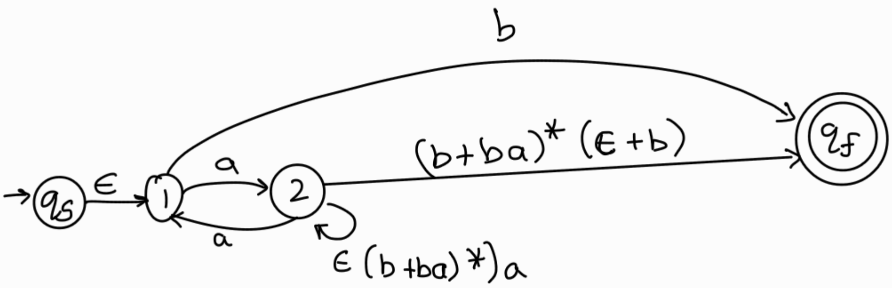
2

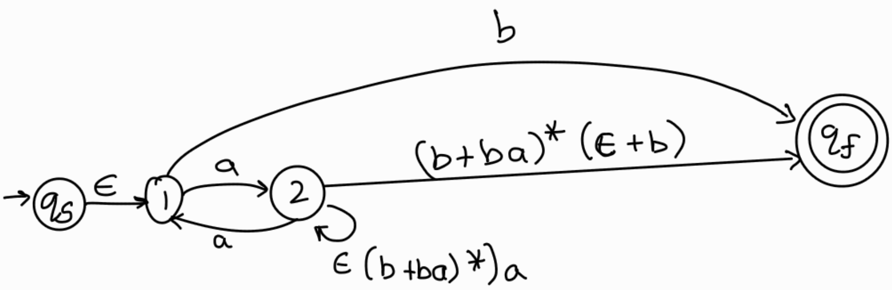

1
2
3
4
a
b
ε
b
b
a
a
a

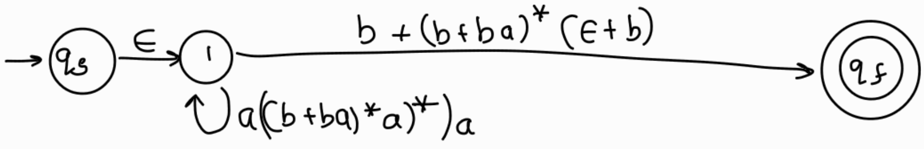

qs
ε
1
2
3
4
a
b
ε
b
b
a
a
a


qs
ε
1
2
3
4
qf
a
b
ε
b
b
ε
ε
a
a
a


qs
ε
1
2
3
qf
a
b
ε
b+ba
ε
bε
a
ε(b+ba)*)a


qs
ε
1
2
qf
a
b
(b+ba)* (ε+b)
a
ε(b+ba)*)a


qs
ε
1
2
qf
a
b
(b+ba)* (ε+b)
a
ε(b+ba)*)a


qs
ε
1
qf
b + (b+ba)* (ε+b)
a((b+ba)*a)*)a

$$\rightarrow q_s \xrightarrow{(b+(b+ba)^*(\epsilon+b))\,(a((b+ba)^*a))^*a)^*} q_f$$

$$b+a(aa)^*b^* + (b+(b+a(aa)^*b^*b\,(a+a(aa)^*b^*b)^*\,(\epsilon + (a+a(aa)^*b^*)$$

Design CFG for w S.T. $w \in \{0, 1\}^* \mid w$ contains at least three 1's ;

$$S \to X1X1X1X$$

$$X \to 0X \mid 1X \mid \epsilon$$

Design CFG for $a^n b^n$ S.T. $n > 1$

$$S \to aSb \mid ab$$

$$G = (\{S\}, \{a, b\}, P, S)$$

$$P \to \{S \to aSb \mid ab\}$$

③ Design CFG for $a^n b^{2n} \mid n \geq 0$.

$$S \to aSbb \mid \epsilon$$

$$G = (\{S\}, \{a, b\}, P, S\}$$

$$P = \{S \to aSbb \mid \epsilon\}$$

(4) $a^m b^n c^{m+n} \mid m, n \geq 0$

$a^m b^n c^n c^m$

$S \rightarrow aSc \mid B$

$B \rightarrow bBc \mid \epsilon$

$a^3 b^5 c^8$

a aa $\underline{bbb}$ ccc CCC

$\underline{bb}\epsilon cc$

Q PDA by empty stack.

$S \longrightarrow XS \mid \epsilon$

$X \rightarrow aXb \mid ab$

$\delta(q, \epsilon, S) \longrightarrow \{ (q, xS), (q, \epsilon) \}$

$\delta(q, \epsilon, X) \longrightarrow \{ (q, aXb), (q, ab) \}$

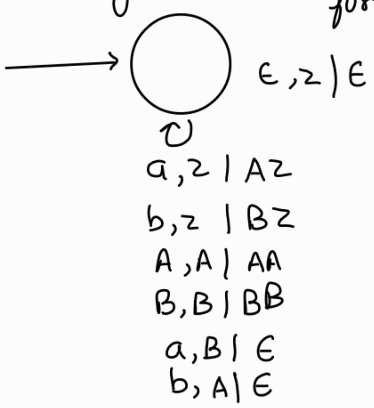
We Pop Here

$\delta(q, a, a) \rightarrow \{ (q, \epsilon) \}$

$\delta(q, b, b) \rightarrow \{ (q, \epsilon) \}$.

$\delta(q, aabb, S)$

Design a PDA with single state for $n_a(w) = n_b(w)$



she will give only
EMPTY Stack mostly.

(A) $S \rightarrow qzq$

(B) $[qzq] \rightarrow a\,[qAz]\,[qAq]$

$[qzq] \rightarrow b\,[qBz]\,[qBq]$

$[qAq] \rightarrow a\,[qAq]\,[qAq]$

$[qBq] \rightarrow b\,[qBq]\,[qBq]$

$[qBq] \rightarrow a$

$[qAq] \rightarrow b$

$[qzq] \rightarrow \epsilon$

$S \rightarrow abab$

$(q, abab, S) \Rightarrow (q, bab, BS)$

$S \rightarrow A$

$A \rightarrow aBA \mid b\epsilon A \mid b$

$B \rightarrow aBB \mid b$

$C \rightarrow bcc \mid a$