Q: Show the CYK Algorithm with the following CNF Grammar?

S -> AB | BC
A -> BA | a
B -> CC | b
C -> AB | a

Is "bbaaa" belongs to the language of Grammar or not using CYK Algorithm. Yes!

Solution: This is because start state is available in top cell.

Substring Length ⟶

j=5	5-1 bbaaa S, A, C				
j=4	4-1 bbaa ϕ	4-2 baaa S, A, C			
j=3	3-1 bba A	3-2 baa ϕ	3-3 aaa S, A, C		
j=2	2-1 bb ϕ	2-2 ba S, A	2-3 aa B	2-4 aa B	
j=1	1-1 b B	1-2 b B	1-3 a A, C	1-4 a A, C	1-5 a A, C
	b	b	a	a	a

j=2 ba: BA, BC → A U S
aa: AA, AC, CA, CC → ϕ ϕ ϕ B

---

j=3 bba
- b ba: B × S, A = BS, BA → ϕ, A
- bb a: ϕ ×

baa
- b aa: B × B = BB → ϕ
- ba a: S, A × A, C = SA, SC, AA, AC → ϕ ϕ ϕ ϕ

aaa
- a aa: A, C × B = AB, CB → S, C; ϕ
- aa a: B × A, C = BA, BC → A, S

---

j=4 bbaa
- b baa: B ϕ
- bb aa: ϕ ×
- bba a: A × A, C = AA, AC → ϕ, ϕ

baaa
- b aaa: B × S, A, C = BS, BA, BC → ϕ, A, S
- ba aa: S, A × B = SB, AB → ϕ, S, C
- baa a: ϕ ×

j=5
- b baaa: B × S, A, C = BS, BA, BC → ϕ, A, S
- bb aaa: ϕ
- bba aa: A × B = AB → S, C
- bbaa a: ϕ ×

Scanned with CamScanner

Q: Show the CYK Algorithm with the following CNF Grammar?

S –> AB | BC
A –> BA | a
B –> CC | b
C –> AB | a

Is "bbbaa" belongs to the language of Grammar or not using CYK Algorithm.

No, it doesn't belongs to this grammer.

Solution:

5	ϕ	—	—	—	—
4	A	ϕ	—	—	—
3	ϕ	A	ϕ	—	—
2	ϕ	ϕ	A, S	B	—
1	B	B	B	A, C	A, C
	b	b	b	a	a

bbba

b bba = B A = A

bb ba = ϕ

bbb a = ϕ

bbaa

b baa B ϕ

bb aa ϕ

bba a A ,(A,C)

AA = ϕ

AC = ϕ

bba

b ba | bb a

B A,S | ϕ

BA , BS

b bb

B ϕ

bb

AA
AC
CA
CC

baa

ba a | b aa

A,S A,C | B B

AA ϕ

AC ϕ

SA ϕ

SC ϕ

BB ϕ

bbbaa

b bbaa B ϕ

bb baa ϕ

bbb aa ϕ

bbba a A A,C

AA

AC

Q: Show the CYK Algorithm with the following

S –> AB | BC
A –> BA | a
B –> CC | b
C –> AB | a

Is "ababa" belongs to the language of Grammar or not using CYK Algorithm.

aba – a → A,C
ba → A,S

ab → S,C
a → A,C

B

Solution:

As S, is here so ababa belongs to language

j=5	S,C,A				
j=4	B	B			
j=3	B	S,C	B		
j=2	S,C	A,S	S,C	A,S	
j=1	A,C	B	A,C	B	A,C
	a	b	a	b	a

bab – b → B
ab → S,C → BS, BC
S

ba → A,S → AB, SB
b → B
S,C

j = 2

ab → A,C × B
ab → AB, CB

ba → B × A,C
→ BA, BC

ba → B × A,C
→ BA, BC

ab → A,C × B
AB, CB

j = 3

aba – a → A,C
ba → A,S → AA, AS, CA, CS

ab → S,C
a → A,C → SA, SC, CA, CC

Q: Show the

S -> AB | BC
A -> BA | a
B -> CC | b
C -> AB | a

Is "aaaaa" belongs to the language of Grammar or not using CYK Algorithm.

Solution:

aaaaa
a,aaaa — (A,C) × B
aa,aaa — B × (S,C,A)
aaa,aa — (S,C,A) × B
aaaa,a — B × (A,C)

AB , CB
S,C ×

BS , BC , BA
× S A

SB , CB , AB
× × S,C

BA BC
A S

j=5	S,C ,A				
j=4	B	B			
j=3	S,C,A	S,C,A	S,C, A		
j=2	B	B	B	B	
j=1	A ,C	A ,C	A ,C	A ,C	A,C
	a	a	a	a	a

Yes it belongs to the grammar as top most box has starting ~~state~~ state in it

aaaa
a ,aaa — (A,C) , (S,C,A)
aa, aa — B , B
aaa, a — (S,C,A) , (A, C)

aaa
a, aa — (A,C) × B -> AB , CB
S,C ×
aa, a — B × (A,C) = (BA), (BC)
A S

aa
(A,C) × (A,C)
AA AC CA CC
× × × B

aaa
a , aa — (A,C) × B -> AB , CB
S,C ×
aa , a — B × (A,C) -> BA , BC
A S

aa
(A,C) × (A,C)
AA AC CA CC
× × × B

aaaa
a, aaa — (A,C) × (S,C,A) — AS , AC , AA , CS , CC , CA
× × × × B✓ ×
aa, aa — B × B — BB ×
aaa, a — (S,C,A) × (A,C) — SA , SC , CA , CC , AA , AC
× × × B × ×

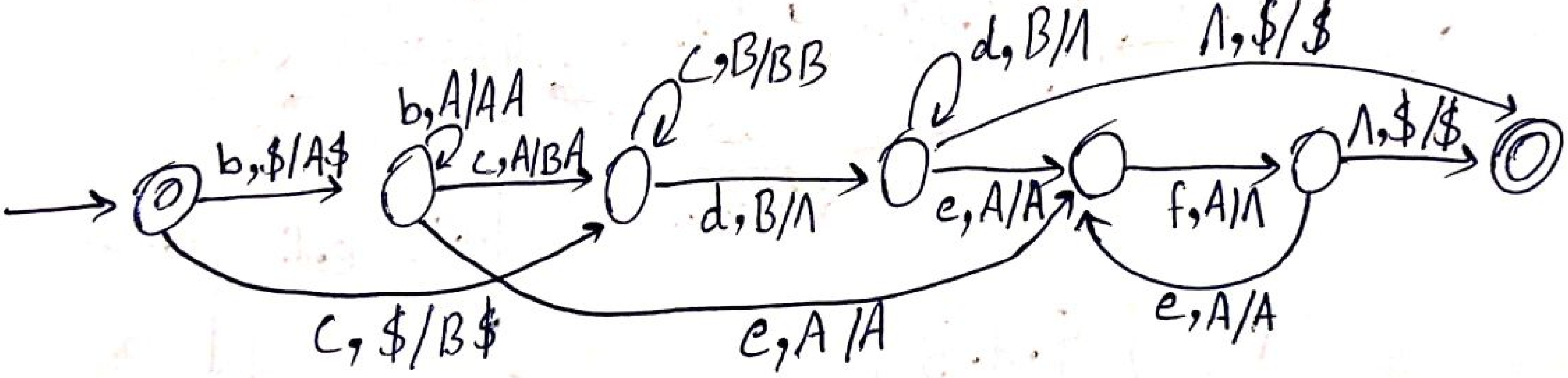
$b^m c^n d^n (ef)^m$

Λ

$m \geq 1 \quad n = 0$

$m = 0 \quad n \geq 1$

$m \geq 1 \quad n \geq 1$



Q1: Design a PDA for the following Language.

$L = \{(ab)^m c^n d^n e^m;\ m, n \geq 0\}$

$m \geq 0 \quad n \geq 0$

$a^m b^m c^n d^n e^m$ = ~~least~~ = Λ — $(m=0, n=0)$

= abcde $(m \geq 0, n \geq 0)$

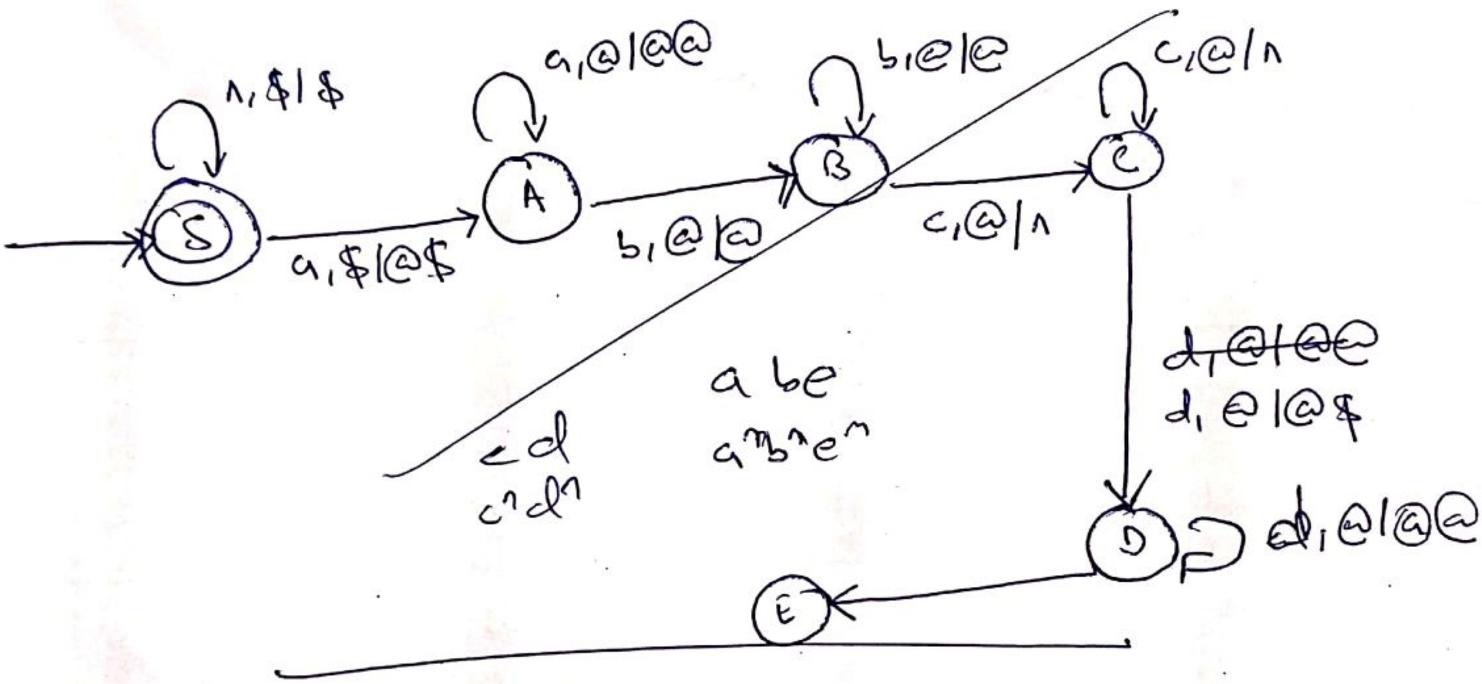
= cd $(m=0, n \geq 0)$

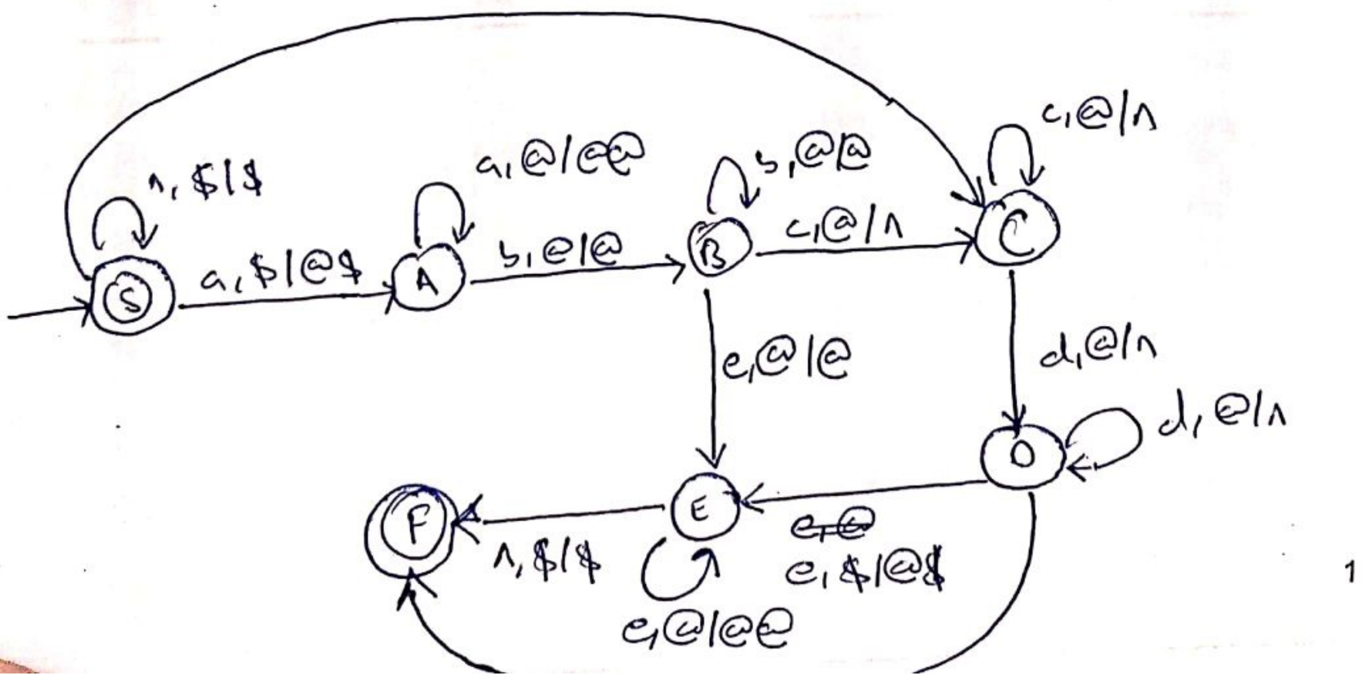
= abe — $(m \geq 0, n=0)$

$\{a, b, e\}$ = @ push

$\{c, d\}$ = pop

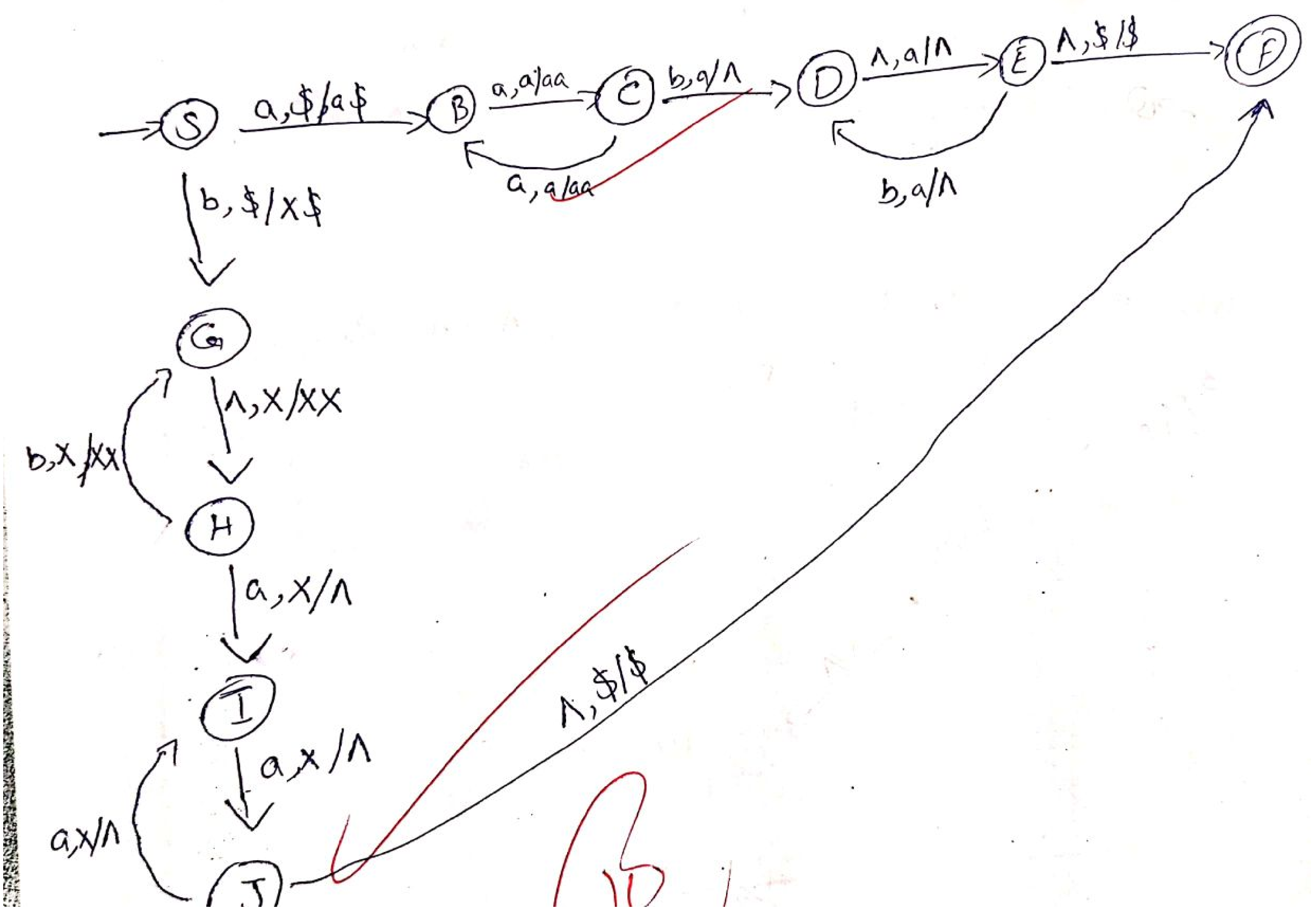
$\Gamma = \{\$, @\}$





Q1: Design a PDA for the following Language.

L contains twice more a's than b's language over $\{a, b\}$



Q1. Design a PDA for the following Language:

L contains 2 more a's than b's language over {a, b}

$\Gamma = \{ A, B, Z_0 \}$

Z_0 is our stack element