

5) $\{ \omega | \omega \in (a+b)^*, \ n_a(\omega) = n_b(\omega) \}$

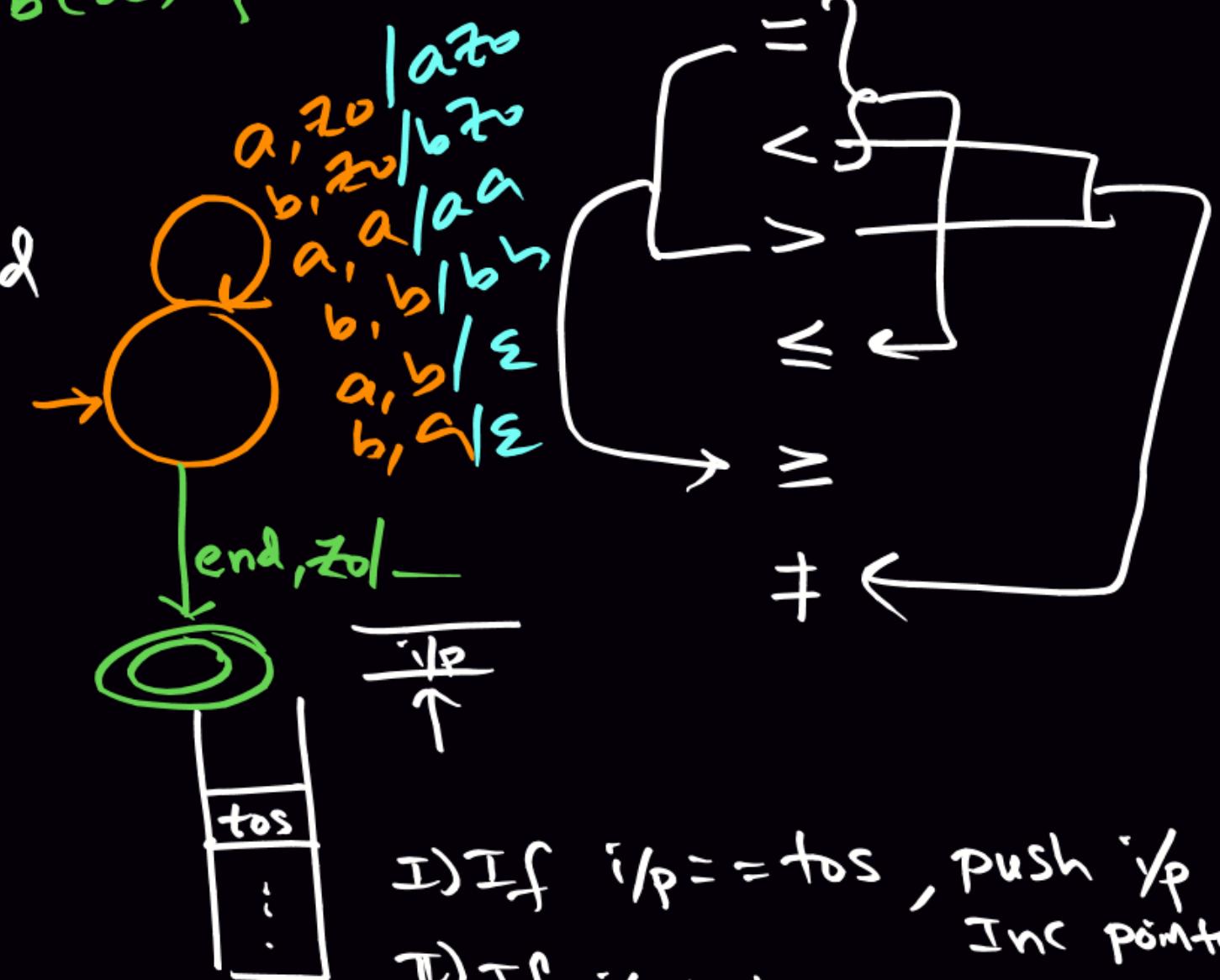
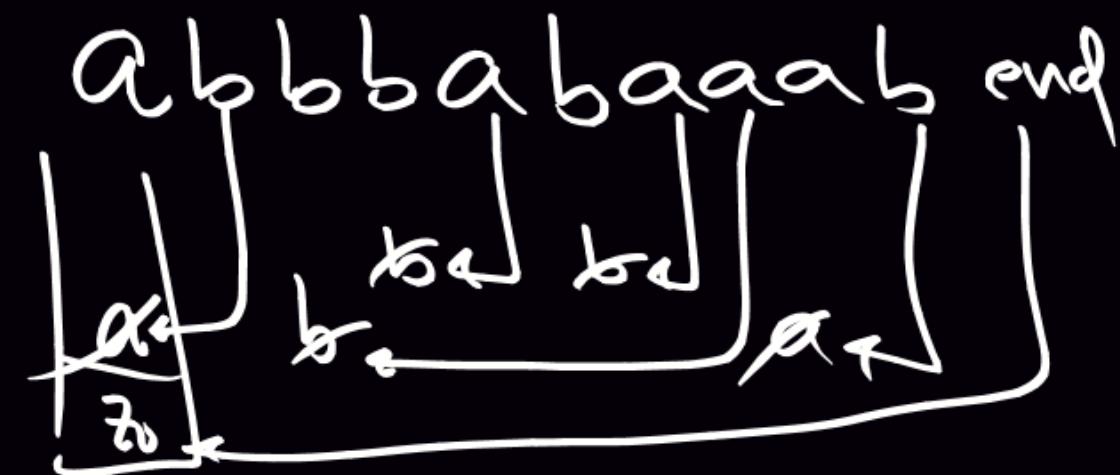
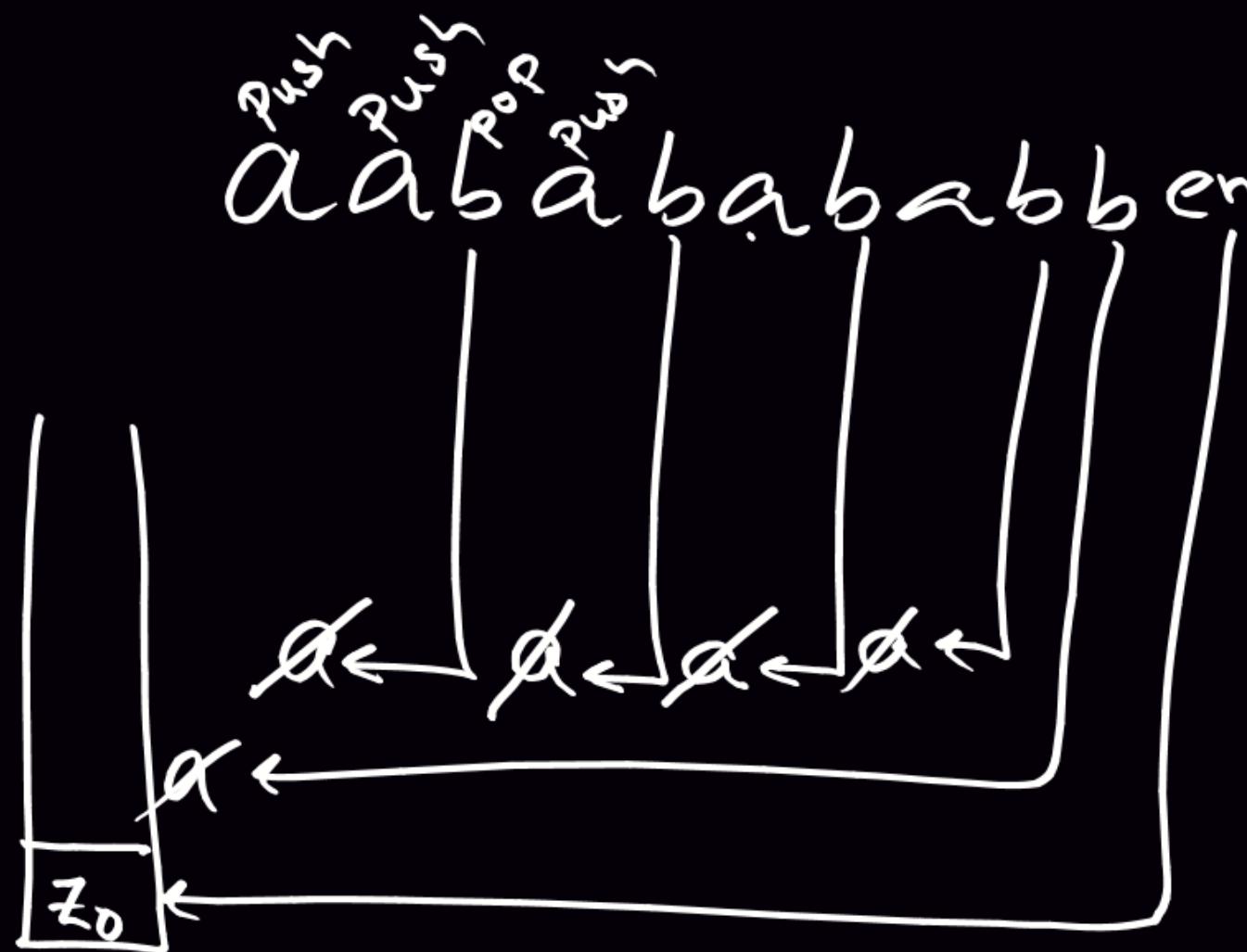
6) $\{ b^n a^n | n \geq 1 \}$

7) $\{ a^n b^{2n} \}$

~~H.W.~~

8) $\{ a^{2n} b^n \}$

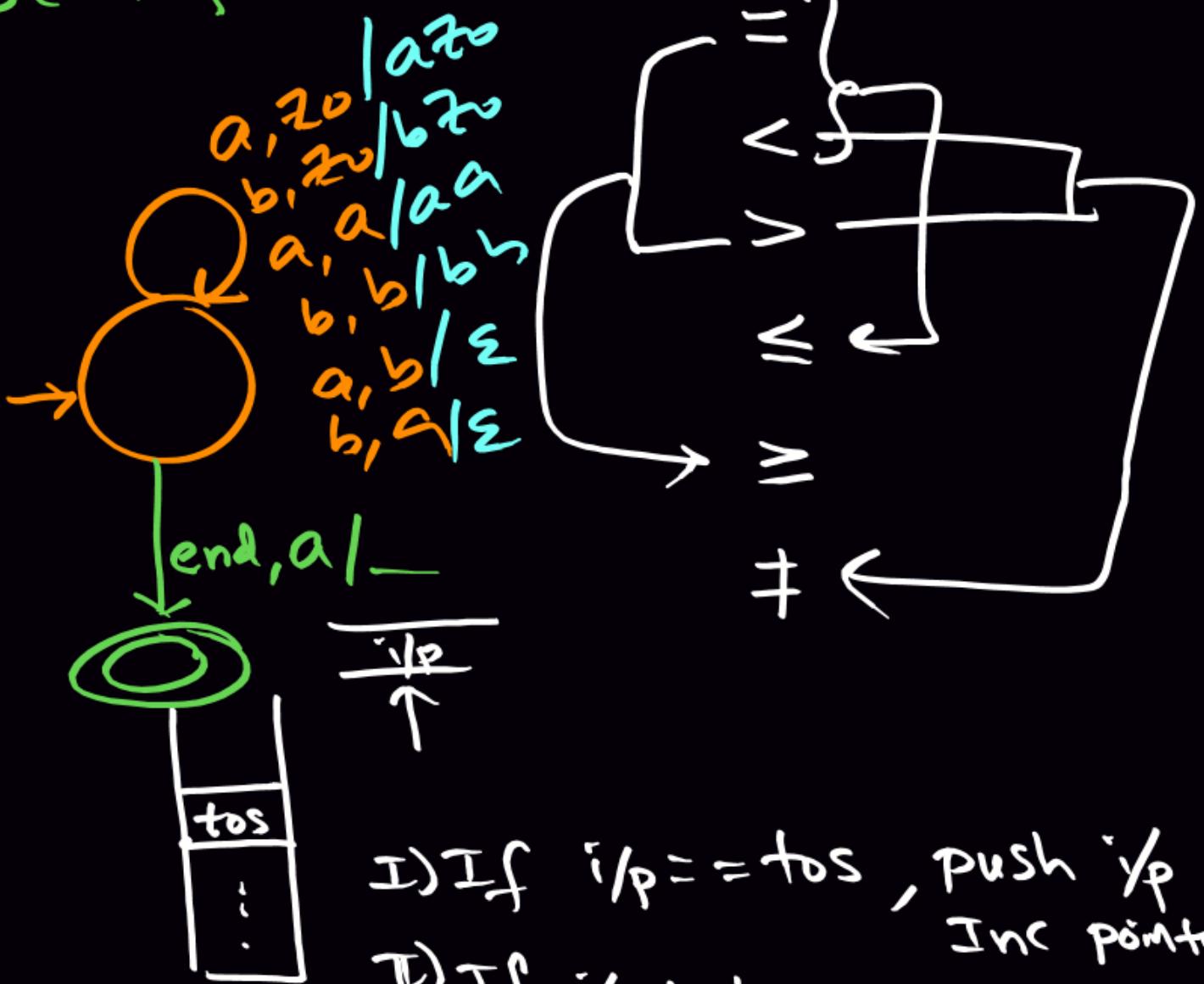
5)_a $\{ w \mid w \in (a+b)^*, n_a(w) = n_b(w) \}$



- I) If $i/p == tos$, push ' $/p$ '
Inc pointer
- II) If $i/p \neq tos$, pop ' $/p$ '
- III) If $i/p = end$ and $tos = z_0$, ACCEPT

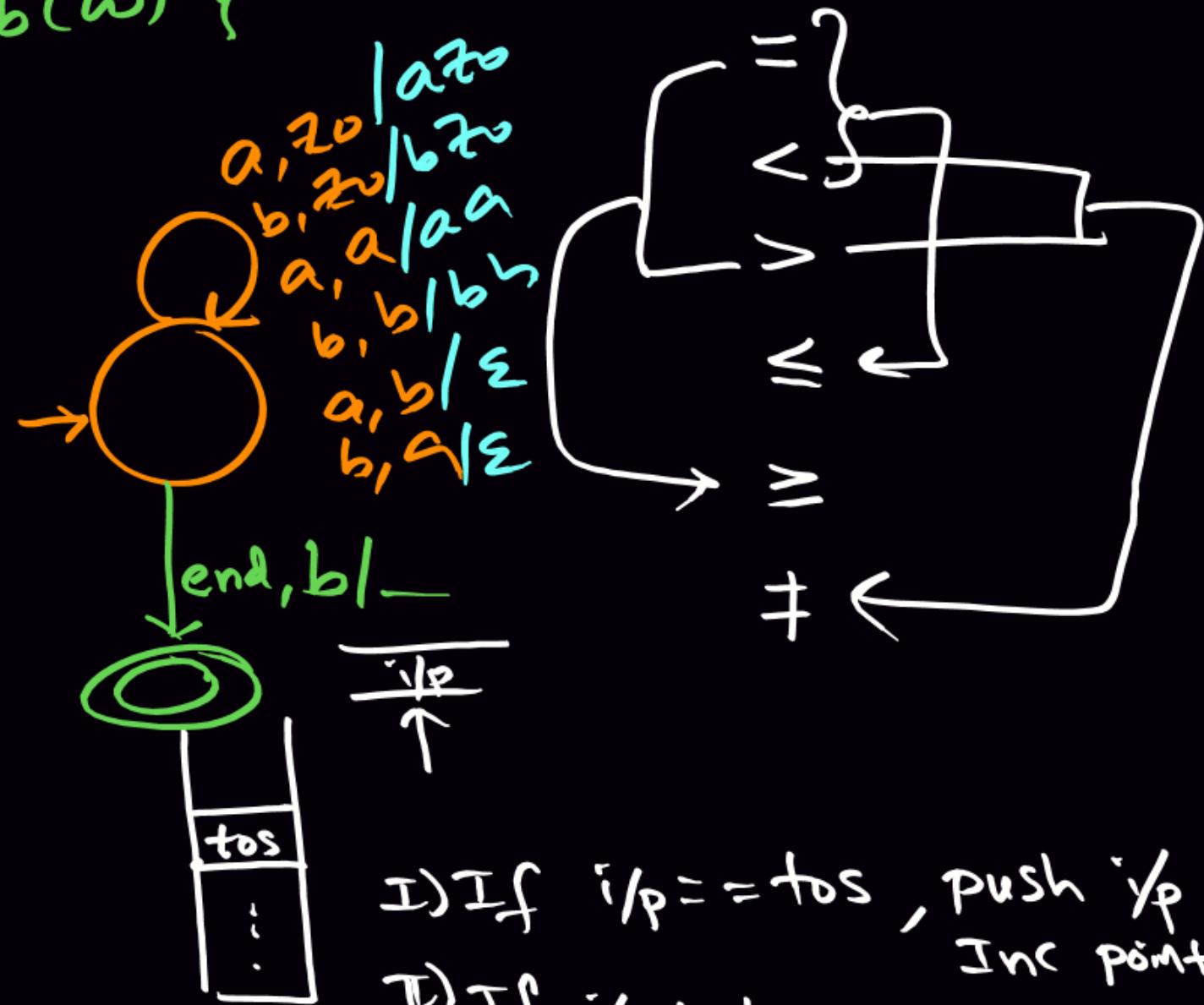
5) $b \{ w \mid w \in (a+b)^*, n_a(w) > n_b(w) \}$

\sim



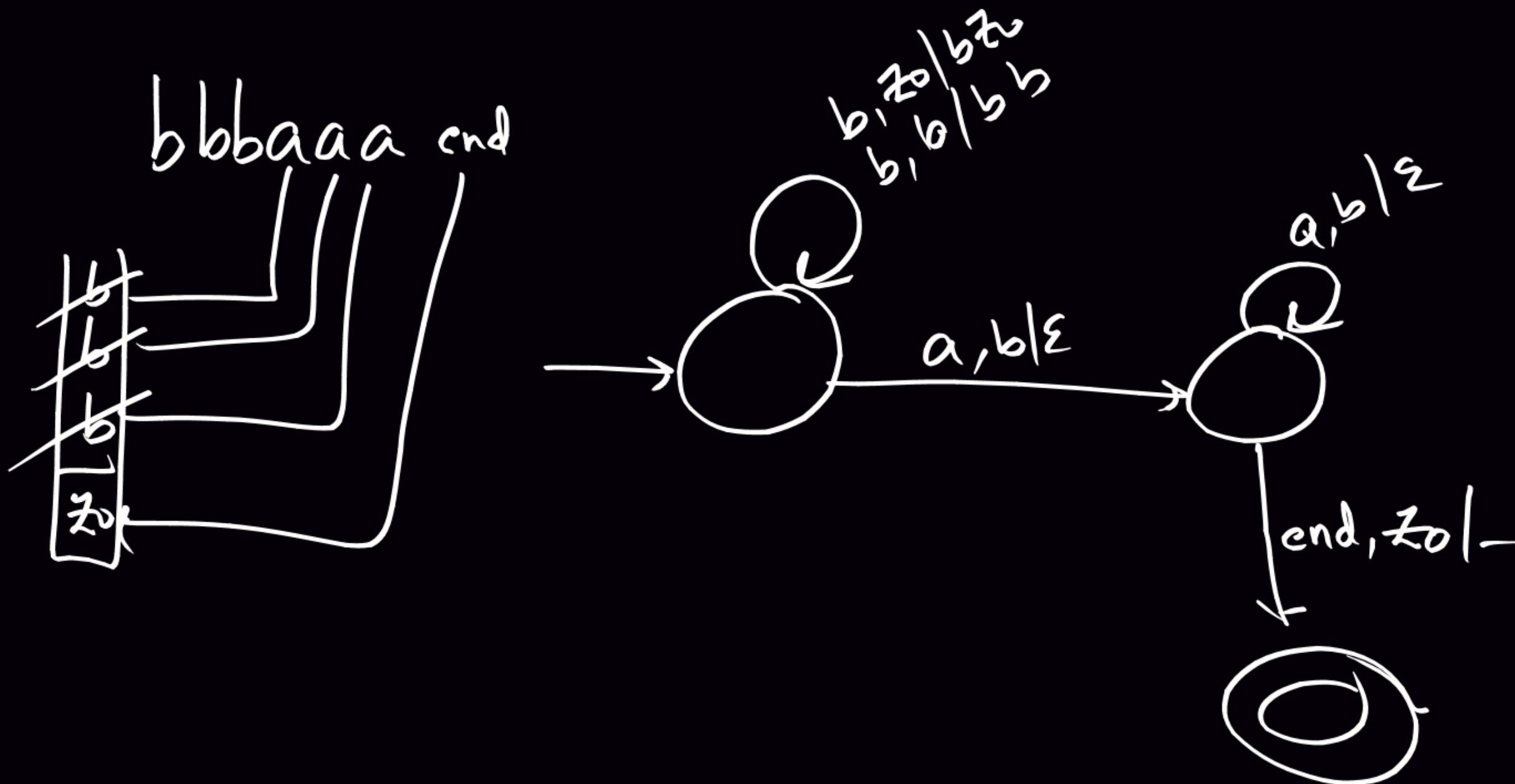
- I) If $i/p == tos$, push ' i/p '
Inc pointer
- II) If $i/p \neq tos$, pop ' i/p '
- III) If $i/p = end$ and $tos = z0$,
ACCEPT

5) $\{ w \mid w \in (a+b)^*, n_a(w) < n_b(w) \}$

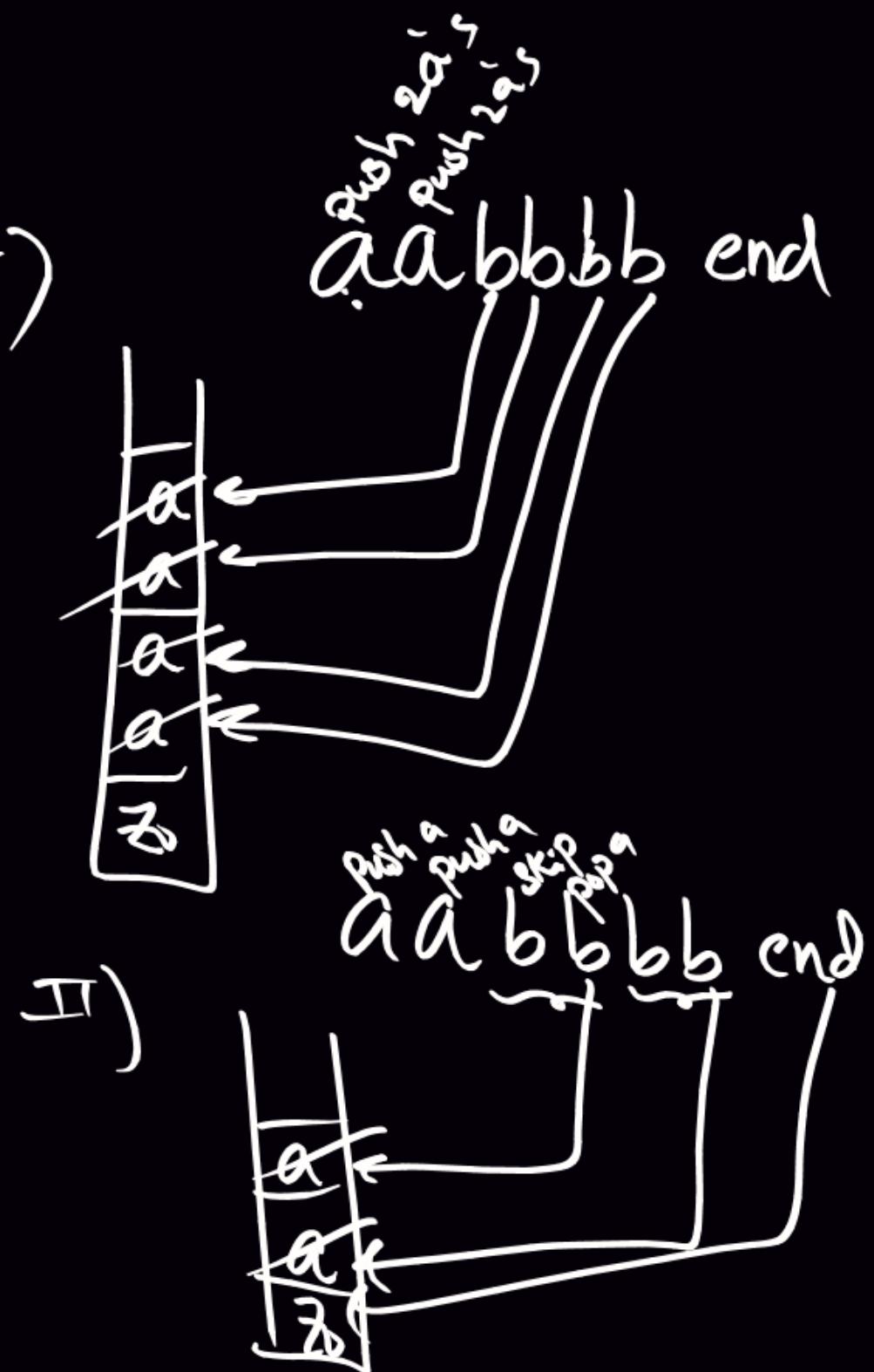
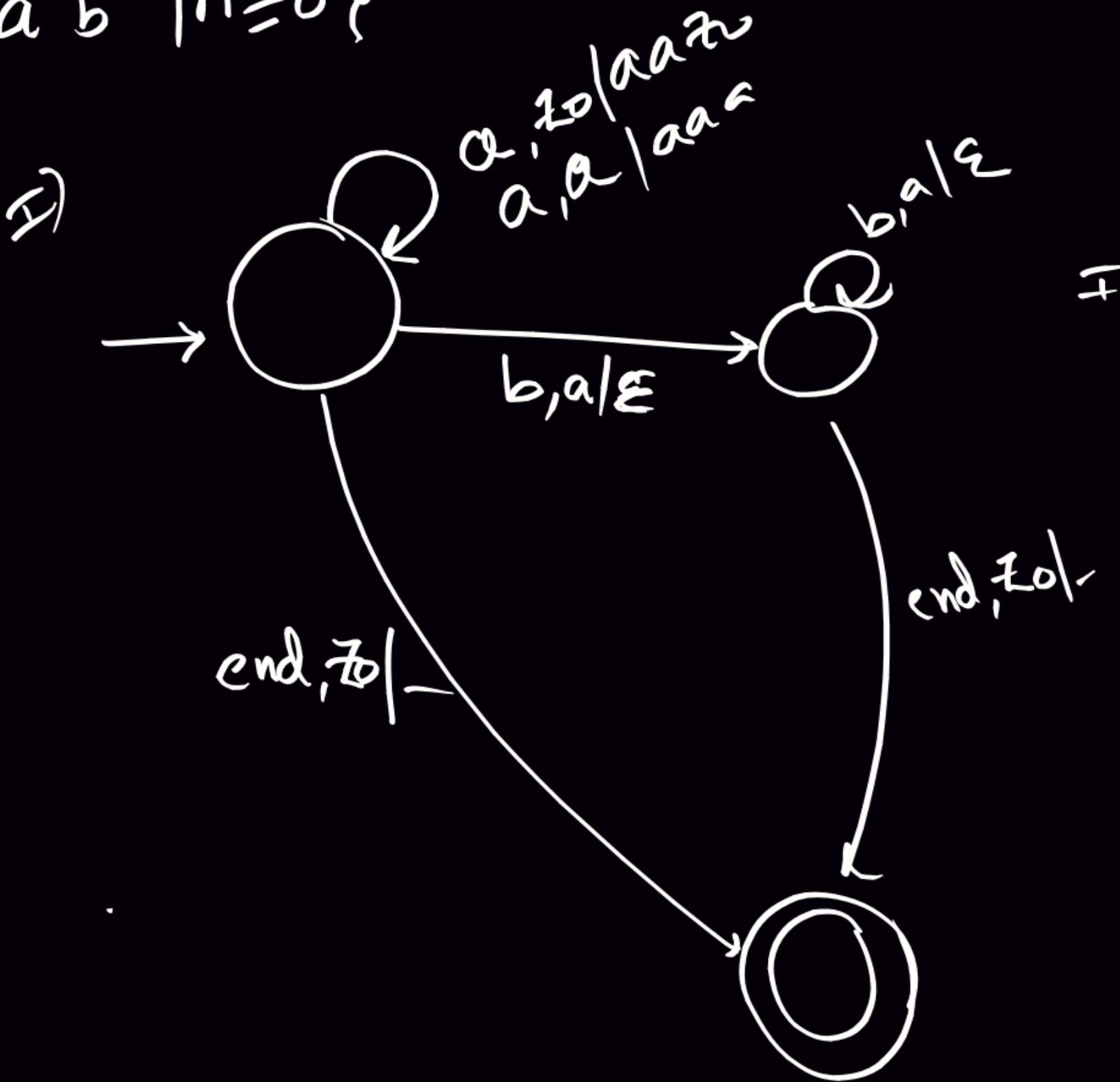


- I) If $i/p == tos$, push ' i/p '
Inc pointer
- II) If $i/p \neq tos$, pop ' i/p '
- III) If $i/p == end$ and $tos == z0$,
ACCEPT

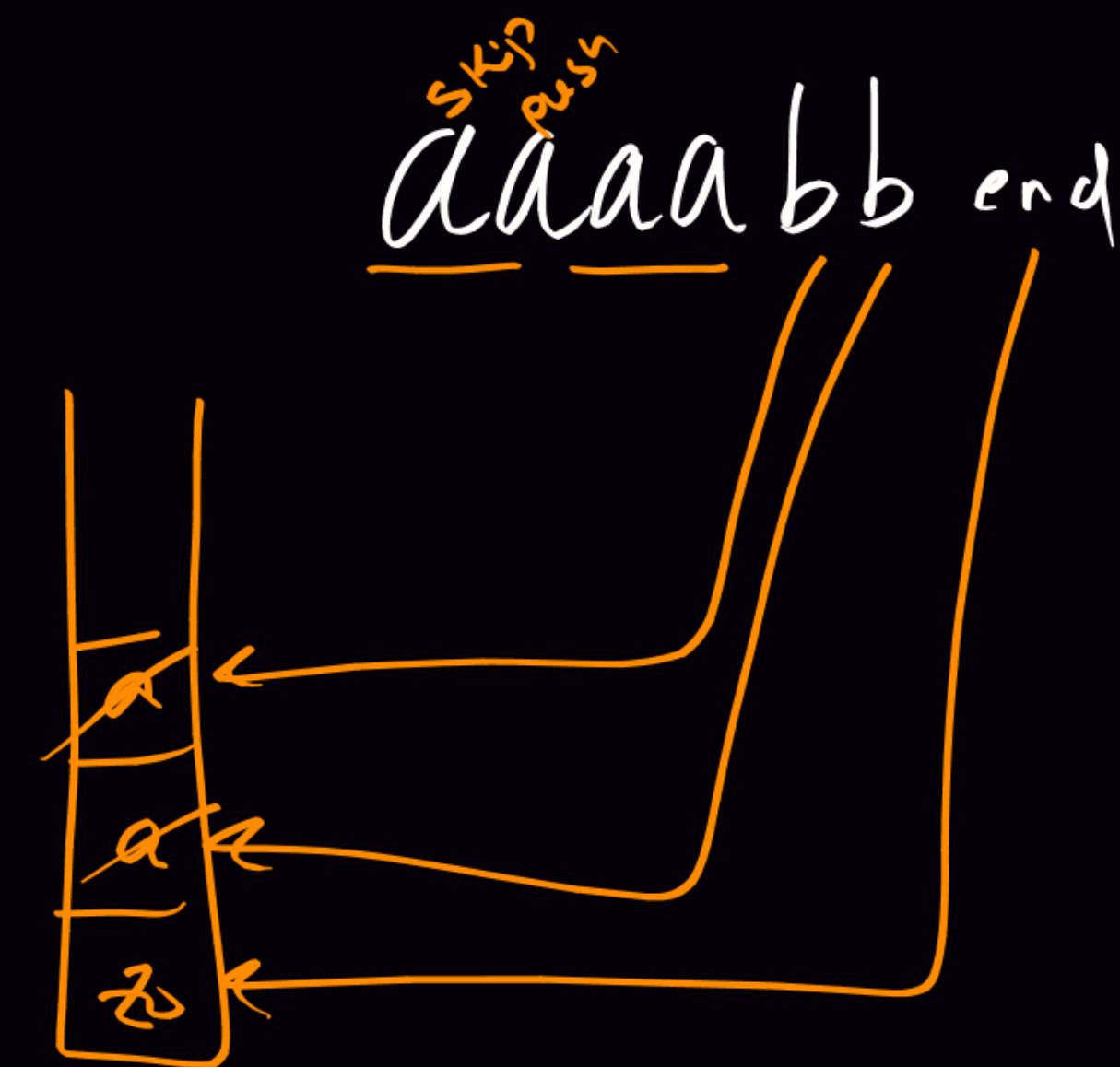
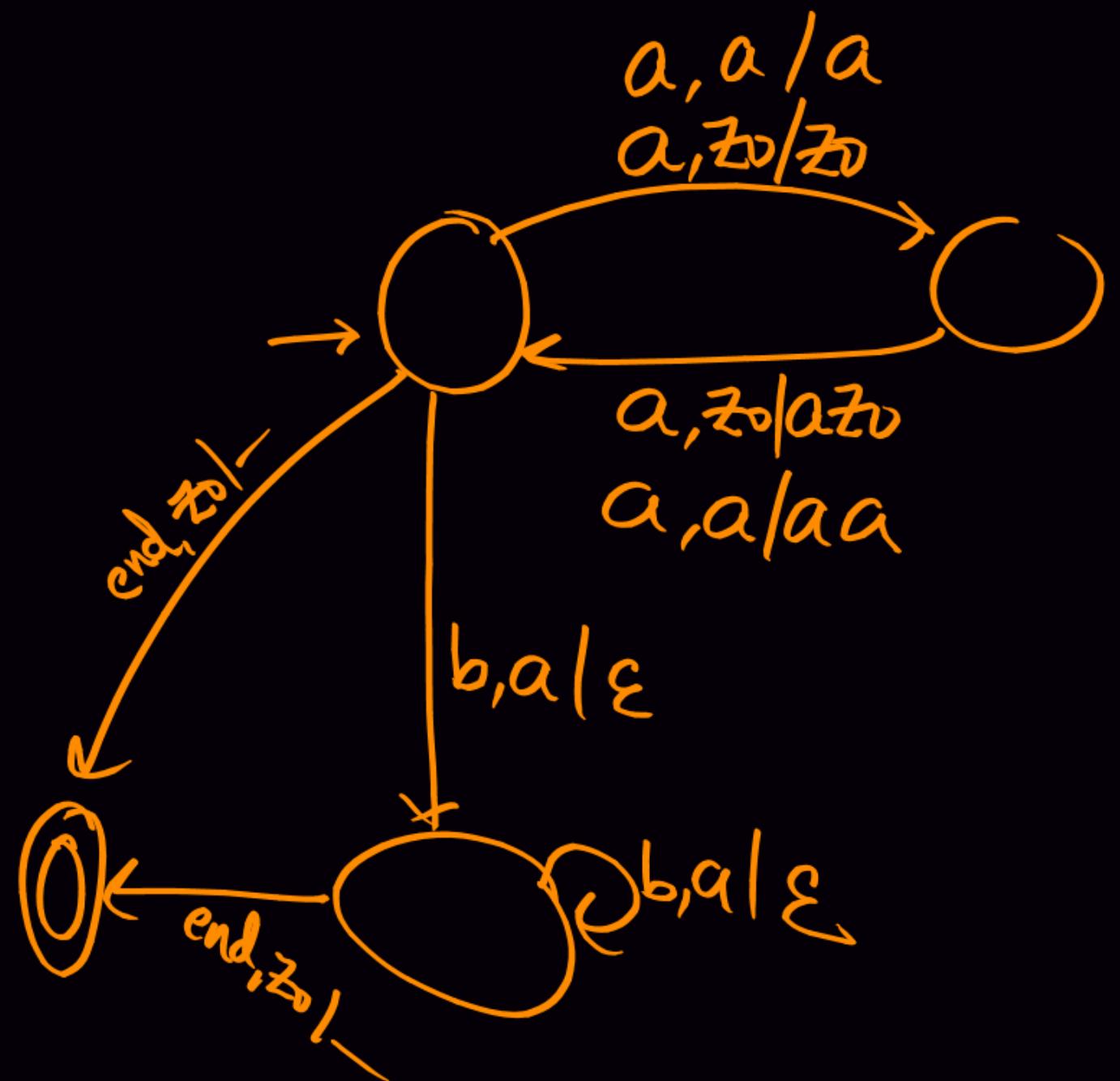
6) $\{ b^n a^n \mid n \geq 1 \}$



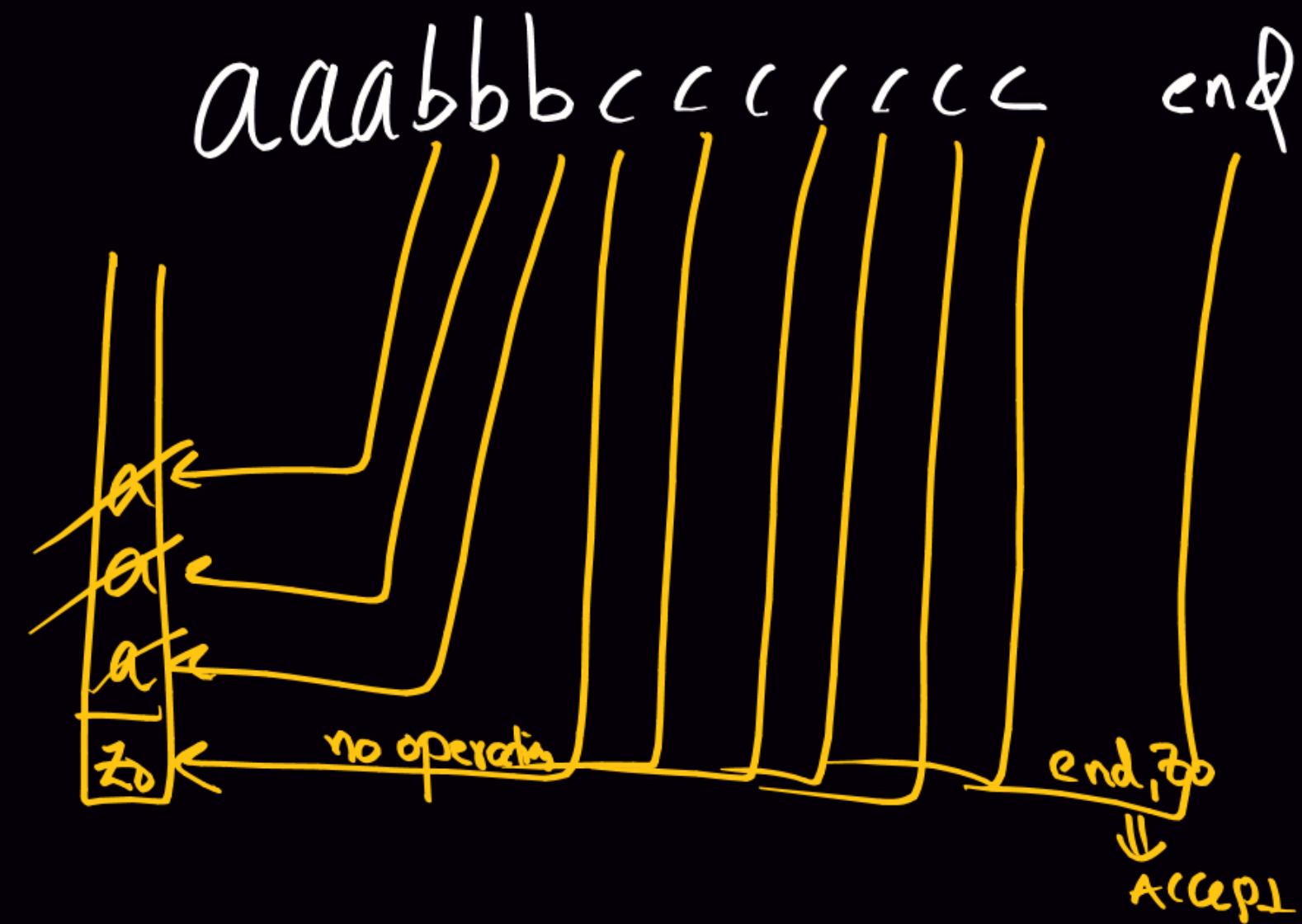
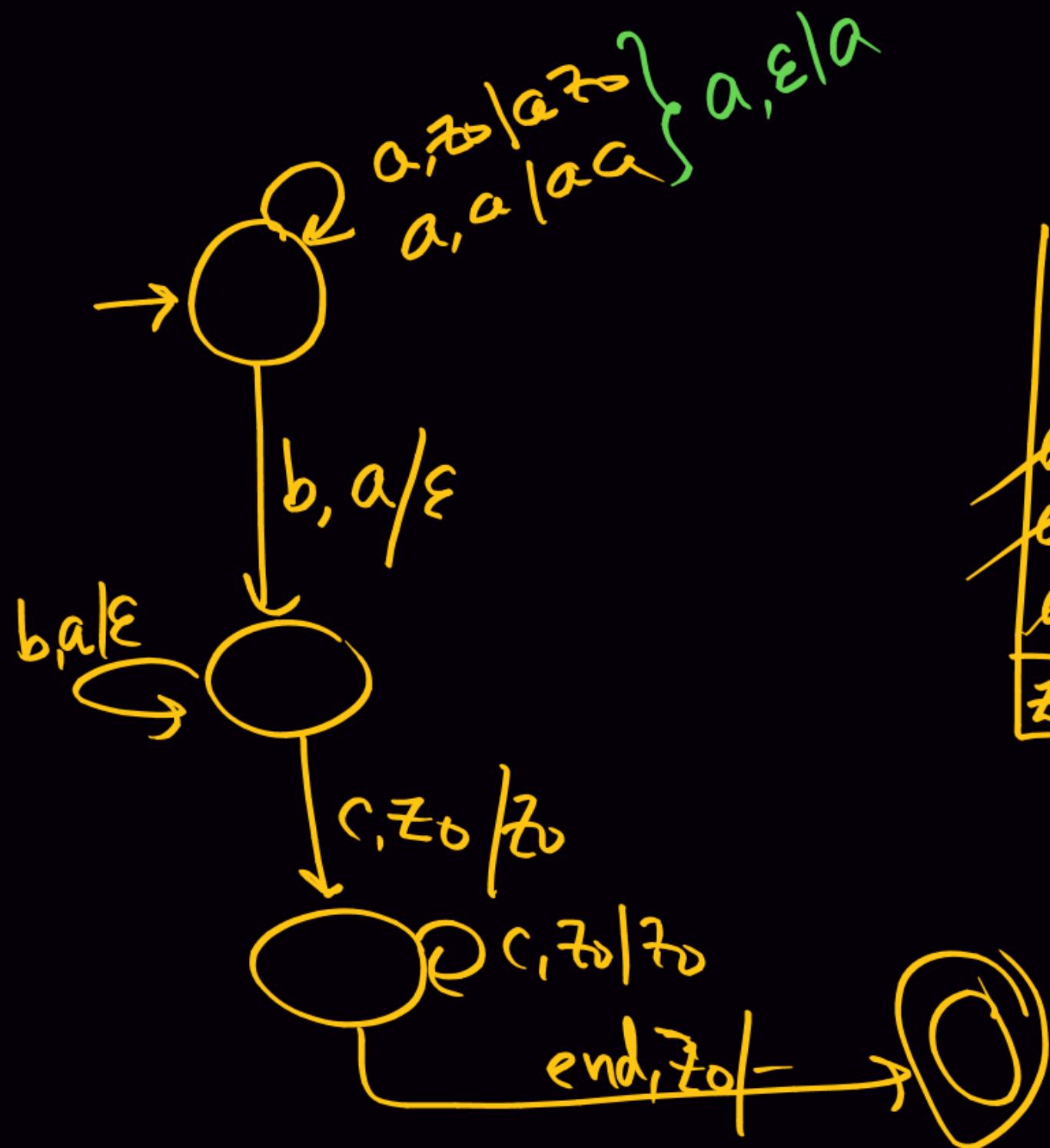
$$7) \quad \{a^n b^n \mid n \geq 0\}$$



8) $\{a^{2^n} b^n | n \geq 0\}$



a) $\{a^n b^n c^+ | n \geq 1\}$



10) $\{a^n b^+ c^n \mid n \geq 1\}$

Push 'a's

Push 'b's

Push 'c's

Pop 'a's

Pop 'b's

Pop 'c's

11) $\{+ a^n b^n c^n \mid n \geq 1\}$

Push 'a's

Push 'b's

Push 'c's

12) $\{a^n b^n c^k d^k \mid n, k \geq 1\}$

Push 'a's

Push 'b's

Push 'c's

Push 'd's

13) $\{a^n b^k c^k d^n \mid n, k \geq 1\}$

Push 'a's

Push 'b's

Push 'c's

Push 'd's

14) $\{a^n b^m c^{n+m} \mid n, m \geq 1\}$

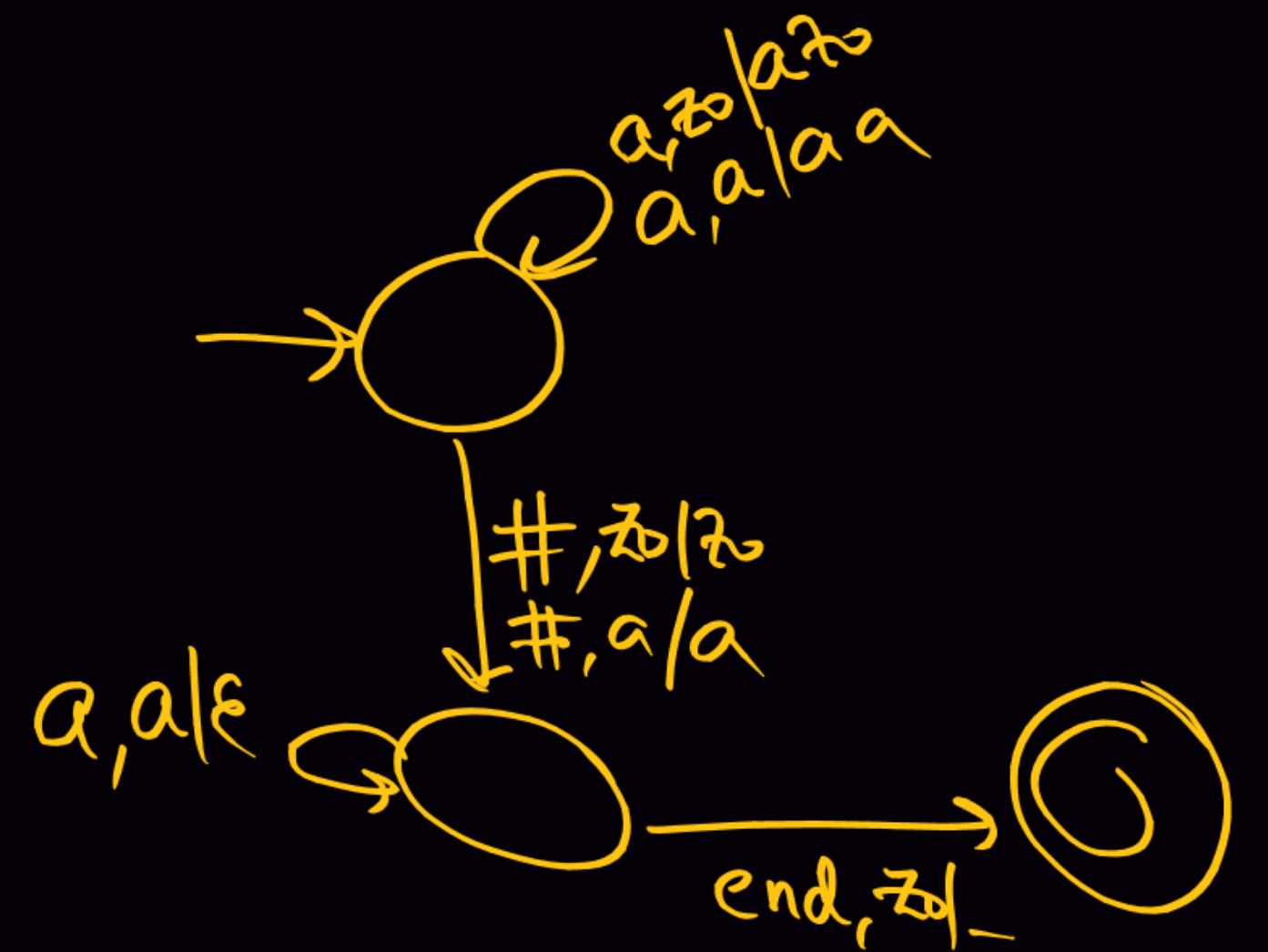
Push 'a's

Push 'b's

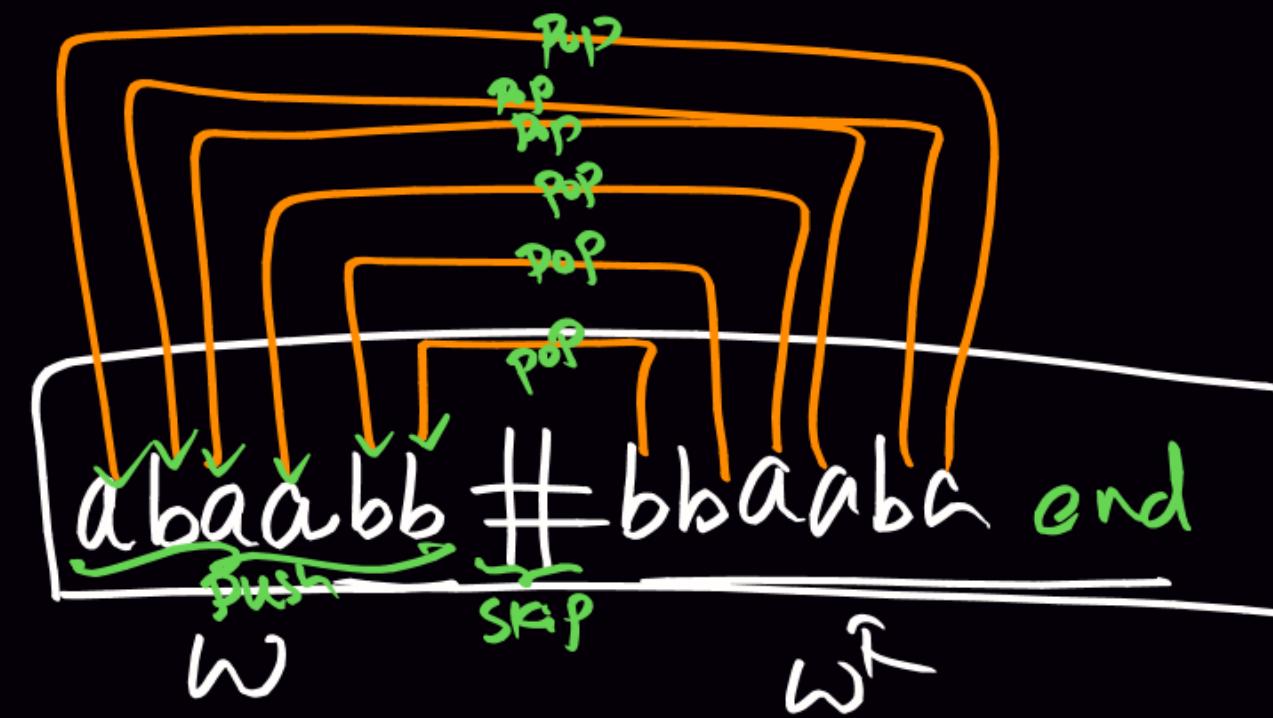
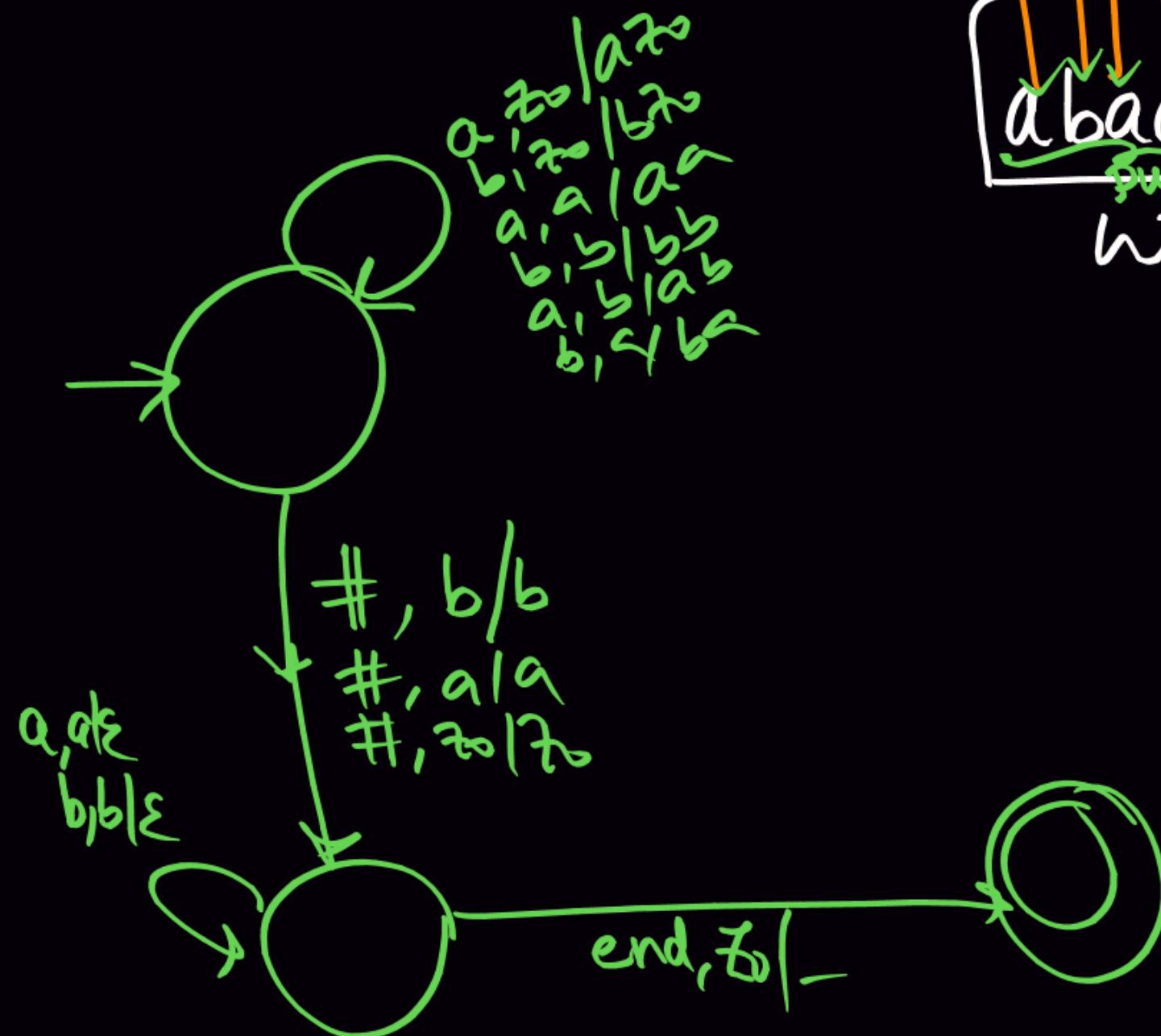
Push 'c's



$$15) \{ w\#w^R \mid w \in \tilde{a}^* \} = \{ \underbrace{\tilde{a}^n \# \tilde{a}^n}_{\text{quasifix}} \mid n \geq 0 \}$$



16) $\{ w\#w^R \mid w \in (a+b)^*\}$



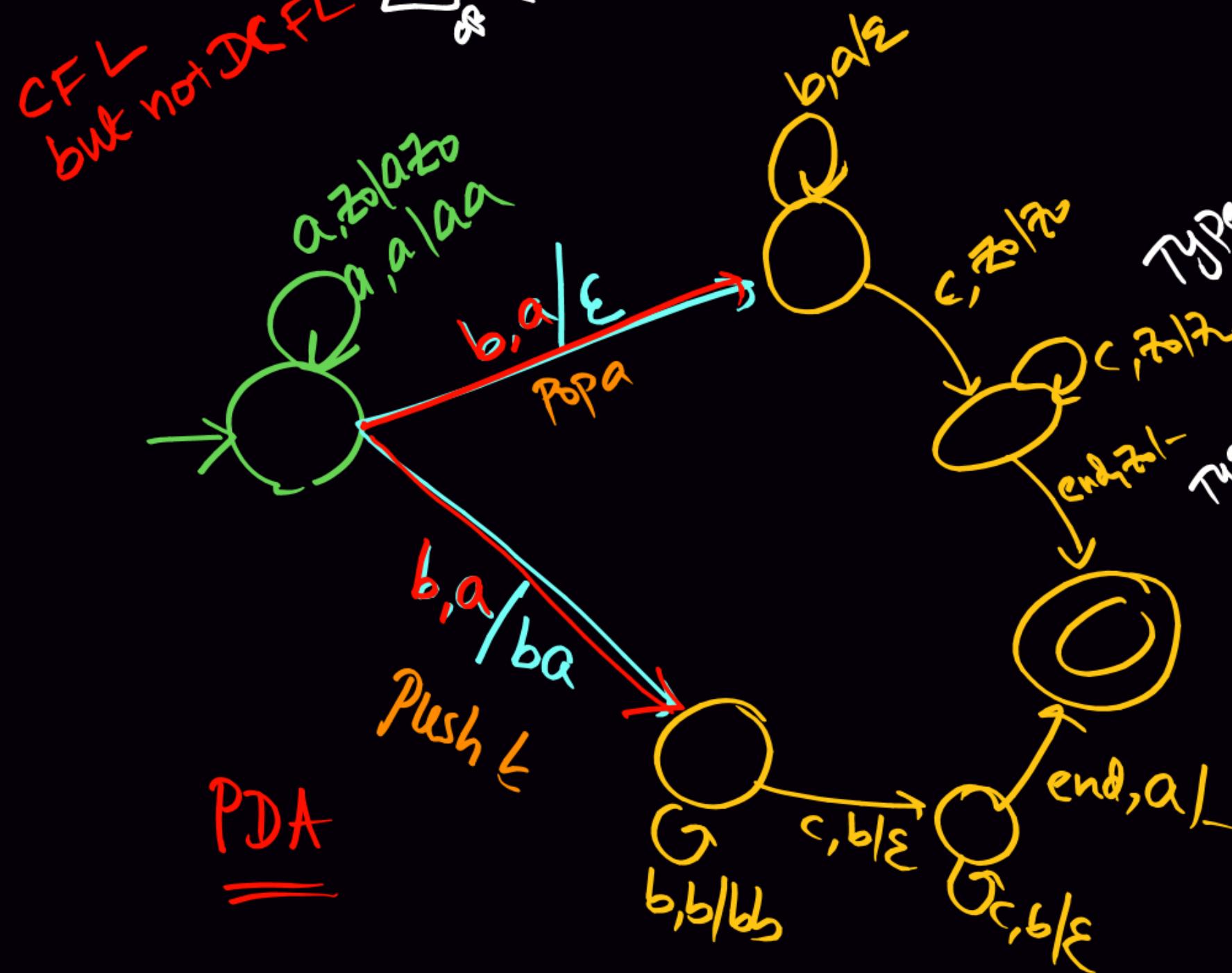
17) $\{a^m b^n c^k \mid m, n, k \geq 1, m=n \text{ OR } n=k\}$

CFL
but not DCFL

solazo

baca

no

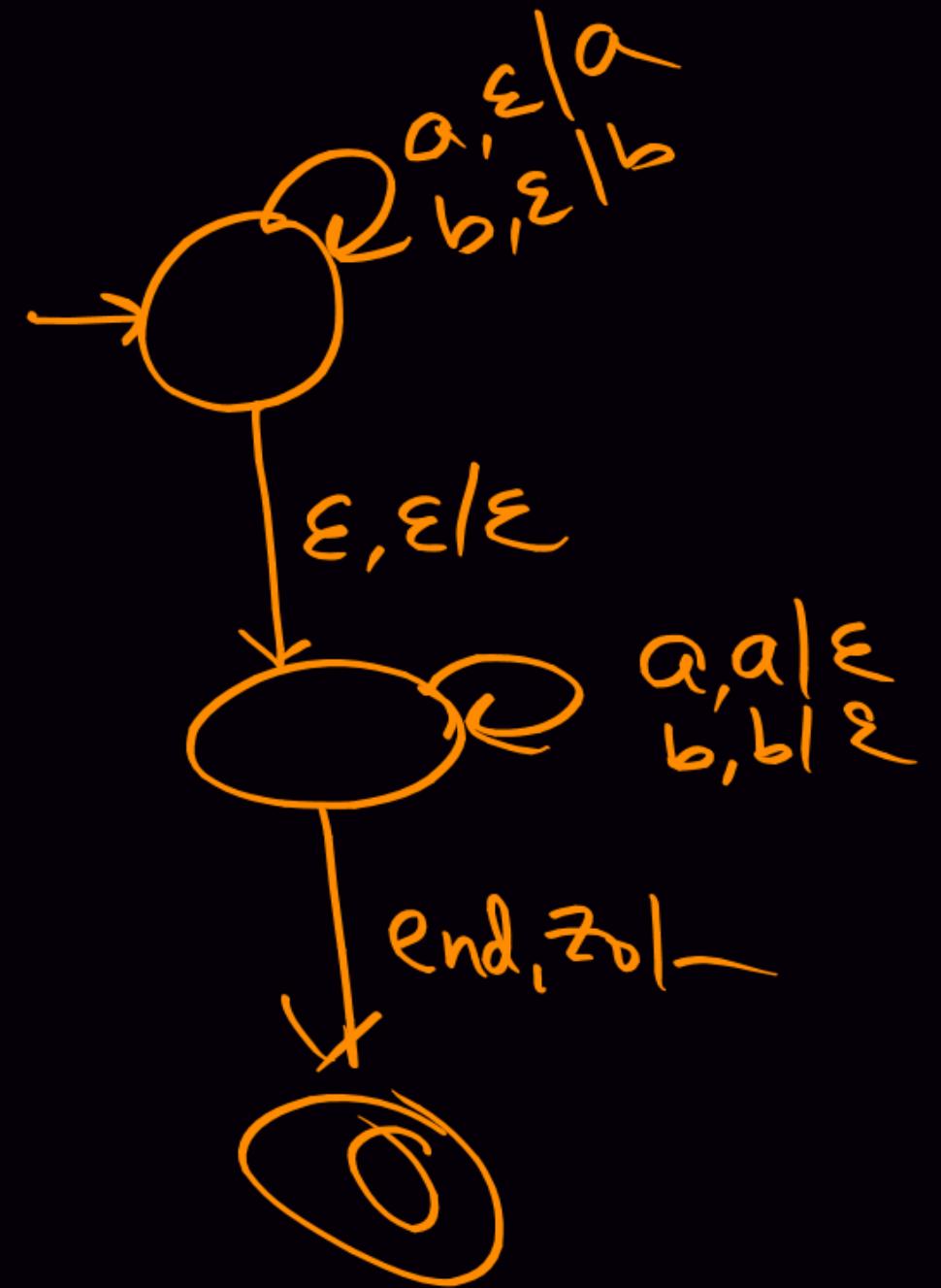


The diagram illustrates two types of string matching using a stack-based approach:

- Type 1:** The string "aabbbccccc" is shown above. A yellow bracket underlines the prefix "aab". A pink bracket highlights the suffix "ccccc". A yellow arrow points from the start of the string to the underline. A pink arrow points from the end of the string to the highlight.
- Type 2:** The string "aabbbccccc" is shown above. A yellow bracket underlines the prefix "aab". A pink bracket highlights the suffix "ccccc". A yellow arrow points from the start of the string to the underline. A pink arrow points from the end of the string to the highlight.
- Stack State:** Below the strings, a stack is shown with elements "a", "a", and "b". A pink arrow labeled "Push b" points to the "b" element. A pink arrow labeled "POP a" points away from the stack.

$$18) \{WW^R | w \in (a+b)^*\}$$

\Downarrow
Push
 \Downarrow
Pop bymatch



19) $\{a^m b^n c^k \mid \text{if } m=\text{even then } n=k\}$

H.b.

20) $\{a^m b^n \mid m=2n \text{ OR } n=2m\}$