Pushdown Automata (PDA)

PDA = NFA-ϵ + Stack

$P = (Q, \Sigma, \Gamma, \delta, q_0, Z_0, F)$

Versions: (1) Acceptance by Final state

(2) Acceptance by Empty stack

(1) $0^n 1^n$ ⟶ PDA

(2) $n_0(w) = n_1(w)$

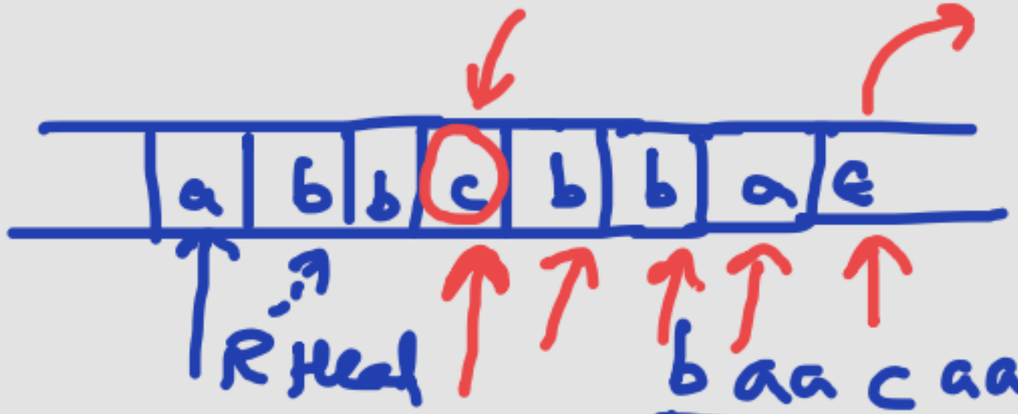
(1) Finite control

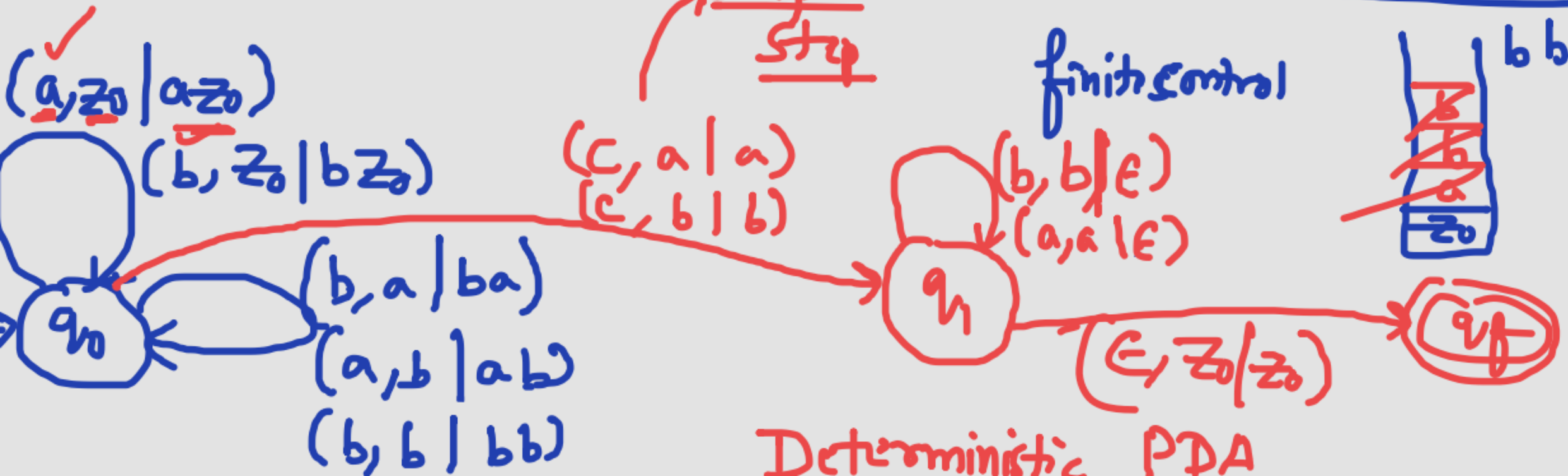
(2) Read head

Center

Ex. $L = \{ w c w^R \mid w \in \{a,b\}^+ \}$. Construct PDA

e.g. $\underbrace{abb}_{w} c \underbrace{bba}_{w^R}$





Deterministic PDA

nitial

Steps

b a a c a a b

Step 6

b a a c a a b

2-3 b a a c a a b

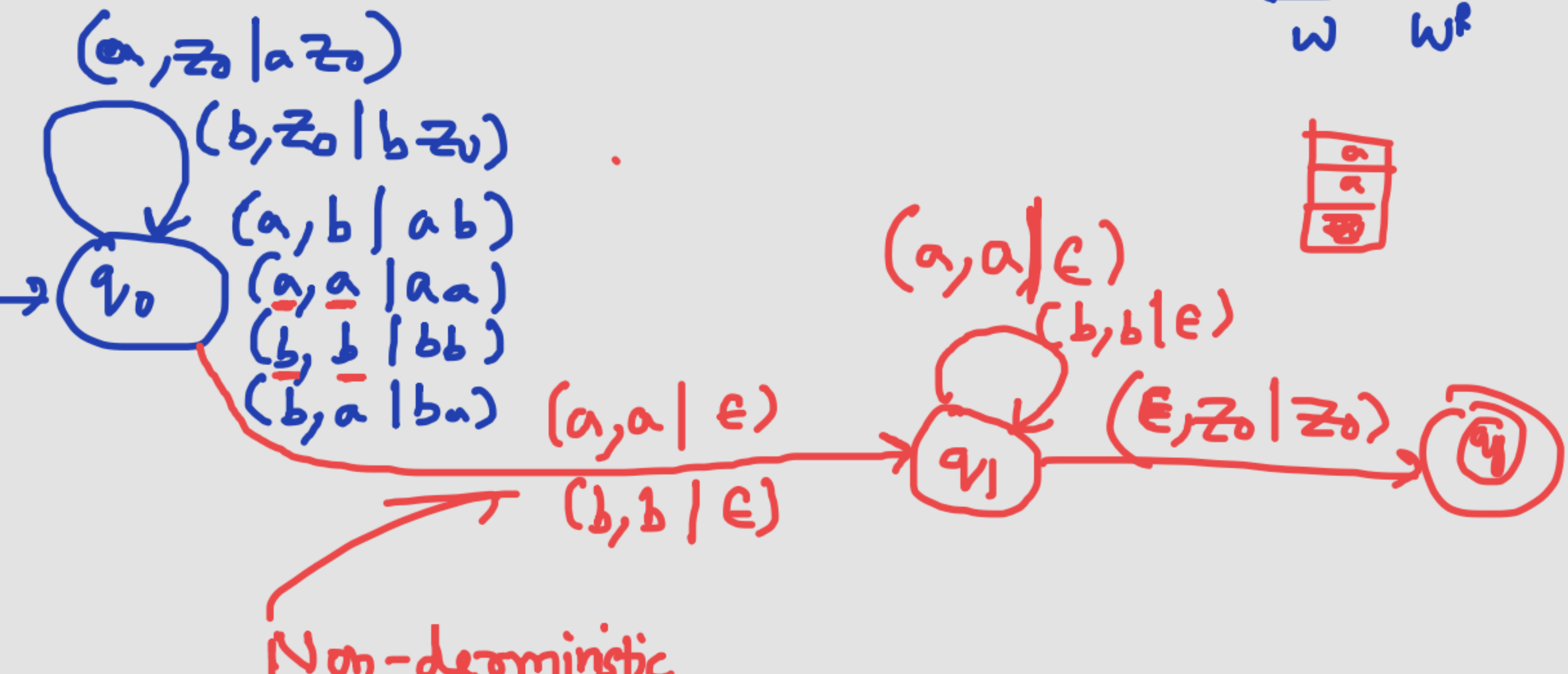
Step 8 Accepting (q_f)

p-4 b a a c a a b

$\frac{aba}{w}\ \frac{aba}{w^R}$, $\frac{abb}{w}\ \frac{bba}{w^R}$, $\frac{aa}{w}\ \frac{aa}{w^R}$, $\frac{aaa}{w^R}\ \frac{aaa}{w^R}$

$\frac{bbb}{w}\ \frac{bbb}{w^R}$

baaaab



$\underline{a}\,\underline{a}$ ✓

$(q_0, \underline{a}aa, aZ_0)$

NC C

$(q_{10}, \underline{a}a, aaZ_0)$ $(q_{11}, \underline{a}a, Z_0)$ ✗

NC C

$(q_{10}, \underline{a}, aaaZ_0)$ $(q_{11}, \underline{a}, aZ_0)$

NC C

(q_{11}, ϵ, Z_0)

→ $\{a^n b^{2n} \mid n \geq 0\}$

→ $\{a^{2n} b^n \mid n \geq 0\}$