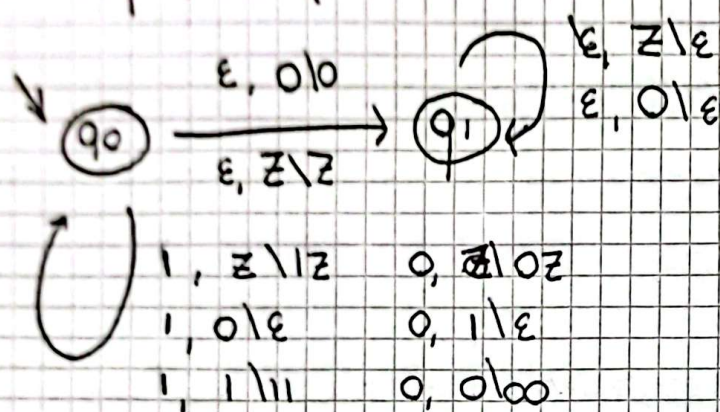


# Esenzione. x-LAB4. LAB4-ES.2

Applicare la trasformazione standard per costruire un CFG a partire dal PDA a pila vuota:



$P = (\{q_0, q_1\}, \{0, 1\}, \{0, 1, Z\}, \delta, q_0, Z)$  dove  $\delta$  è data da:

- ①  $\delta(q_0, 1, Z) = \{(q_0, 1Z)\}$
- ②  $\delta(q_0, 1, 0) = \{(q_0, \epsilon)\}$
- ③  $\delta(q_0, 1, 1) = \{(q_0, 11)\}$
- ④  $\delta(q_0, 0, Z) = \{(q_0, 0Z)\}$
- ⑤  $\delta(q_0, 0, 0) = \{(q_0, 00)\}$
- ⑥  $\delta(q_0, 0, 1) = \{(q_0, \epsilon)\}$
- ⑦  $\delta(q_0, \epsilon, 0) = \{(q_1, 0)\}$
- ⑧  $\delta(q_0, \epsilon, Z) = \{(q_1, Z)\}$
- ⑨  $\delta(q_1, \epsilon, 0) = \{(q_1, \epsilon)\}$
- ⑩  $\delta(q_1, \epsilon, Z) = \{(q_1, \epsilon)\}$

①  $(1, Z, 1Z)$  con  $k=2 \rightarrow [q_0 Z P_2] = 1 [q_0 1 P_1] [P_1 Z P_2]$

$P_1, P_2$	
$q_0   q_0$	$= [q_0 Z q_0] \Rightarrow 1 [q_0 1 q_0] [q_0 Z q_0]$
$q_0   q_1$	$= [q_0 Z q_1] \Rightarrow 1 [q_0 1 q_0] [q_0 Z q_1]$
$q_1   q_1$	$= [q_1 Z q_1] \Rightarrow 1 [q_1 1 q_1] [q_1 Z q_1]$
$q_1   q_0$	$= [q_1 Z q_0] \Rightarrow 1 [q_1 Z q_0] [q_1 Z q_0]$

②  $(1, 0, \epsilon)$  con  $k=0 \rightarrow [q_0 0 P_0] = [q_0 0 q_0] \rightarrow \epsilon$

③  $(1, 1, 11)$  con  $k=2 \rightarrow [q_0 1 P_2] = 1 [q_0 1 P_1] [P_1 1 P_2]$

$P_1, P_2$	
$q_0   q_0$	$= [q_0 1 q_0] \Rightarrow 1 [q_0 1 q_0] [q_0 1 q_0]$
$q_0   q_1$	$= [q_0 1 q_1] \Rightarrow 1 [q_0 1 q_0] [q_0 1 q_1]$
$q_1   q_1$	$= [q_1 1 q_1] \Rightarrow 1 [q_1 1 q_1] [q_1 1 q_1]$
$q_1   q_0$	$= [q_1 1 q_0] \Rightarrow 1 [q_1 1 q_1] [q_1 1 q_0]$



④  $(0, Z, 0Z)$  con  $k=2 \rightarrow [q_0 Z P_2] = 0 [q_0 O P_1] [P_1 Z P_2]$

$p_1$	$p_2$	
$q_0$	$q_0$	$= [q_0 Z q_0] \Rightarrow 0 [q_0 O q_0] [q_0 Z q_0]$
$q_0$	$q_1$	$= [q_0 Z q_1] \Rightarrow 0 [q_0 O q_0] [q_0 Z q_1]$
$q_1$	$q_1$	$= [q_1 Z q_1] \Rightarrow 0 [q_1 O q_1] [q_1 Z q_1]$
$q_1$	$q_0$	$= [q_1 Z q_0] \Rightarrow 0 [q_1 O q_1] [q_1 Z q_0]$

⑤  $(0, 0, 00)$  con  $k=2 \rightarrow [q_0 O P_2] = 0 [q_0 O P_1] [P_1 O P_2]$

$p_1$	$p_2$	
$q_0$	$q_0$	$= [q_0 O q_0] \Rightarrow 0 [q_0 O q_0] [q_0 O q_0]$
$q_0$	$q_1$	$= [q_0 O q_1] \Rightarrow 0 [q_0 O q_0] [q_0 O q_1]$
$q_1$	$q_1$	$= [q_1 O q_1] \Rightarrow 0 [q_1 O q_1] [q_1 O q_1]$
$q_1$	$q_0$	$= [q_1 O q_0] \Rightarrow 0 [q_1 O q_1] [q_1 O q_0]$

⑥  $(0, 1, \epsilon)$  con  $k=0 \rightarrow [q_0 1 P_0] = [q_0 1 q_0] \rightarrow \epsilon$

⑦  $(\epsilon, 0, 0)$  con  $k=1 \rightarrow [q_0 O P_1] = 0 [q_1 O P_1]$

$p_1$	
$q_0$	$= [q_0 O q_0] \Rightarrow 0 [q_1 O q_0]$
$q_1$	$= [q_0 O q_1] \Rightarrow 0 [q_1 O q_1]$

⑧  $(\epsilon, Z, Z)$  con  $k=1 \rightarrow [q_0 Z P_1] = [q_1 Z P_1]$

$p_1$	
$q_0$	$= [q_0 Z q_0] \Rightarrow Z [q_1 Z q_0]$
$q_1$	$= [q_0 Z q_1] \Rightarrow Z [q_1 Z q_1]$

⑨  $(\epsilon, 0, \epsilon)$  con  $k=0 \rightarrow [q_1 O P_0] = [q_1 O q_1] \rightarrow \epsilon$

⑩  $(\epsilon, Z, \epsilon)$  con  $k=0 \rightarrow [q_1 Z P_0] = [q_1 Z q_1] \rightarrow \epsilon$

Rinominando:

$[q_0 Z q_0] = A$  ,  $[q_0 1 q_0] = E$  ,  $[q_0 O q_0] = I$   
 $[q_0 Z q_1] = B$  ,  $[q_0 1 q_1] = F$  ,  $[q_0 O q_1] = L$   
 $[q_1 Z q_1] = C$  ,  $[q_1 1 q_1] = G$  ,  $[q_1 O q_1] = M$   
 $[q_1 Z q_0] = D$  ,  $[q_1 1 q_0] = H$  ,  $[q_1 O q_0] = N$



$$A \rightarrow 1EA$$

$$B \rightarrow 1EB$$

$$C \rightarrow 1GC$$

$$D \rightarrow 1GD$$

$$E \rightarrow 1EE$$

$$F \rightarrow 1EF$$

$$G \rightarrow 1GG$$

$$H \rightarrow 1GH$$

$$I \rightarrow \varepsilon$$

$$E \rightarrow \varepsilon$$

$$M \rightarrow \varepsilon$$

$$C \rightarrow \varepsilon$$

$$I \rightarrow 0II$$

$$L \rightarrow 0IL$$

$$M \rightarrow 0MM$$

$$N \rightarrow 0MN$$

$$A \rightarrow 0II$$

$$B \rightarrow 0IL$$

$$C \rightarrow 0MM$$

$$D \rightarrow 0MN$$

$$I \rightarrow 0N$$

$$L \rightarrow 0M$$

$$A \rightarrow ZD$$

$$B \rightarrow ZC$$

$\rightarrow$

$$A \rightarrow 1EA \mid ZD \mid 0II$$

$$B \rightarrow 1EB \mid 0IL \mid ZC$$

$$D \rightarrow 1GD \mid 1GG$$

$$E \rightarrow 1EE \mid \varepsilon$$

$$F \rightarrow 1EF$$

$$G \rightarrow 1GG$$

$$H \rightarrow 1GH$$

$$I \rightarrow 0II \mid 0N \mid \varepsilon$$

$$L \rightarrow 0IL \mid 0M$$

$$M \rightarrow 0MM \mid \varepsilon$$

$$N \rightarrow 0MN$$

$$C \rightarrow 1GC \mid 0MM \mid \varepsilon$$