

Integrantes

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1.

$$S \rightarrow SS \mid SBB \mid CCE$$
$$A \rightarrow aE \mid bE$$
$$B \rightarrow bB \mid Db$$
$$C \rightarrow aC \mid bB$$
$$D \rightarrow aDb \mid ab \mid \epsilon$$
$$E \rightarrow aA \mid bB$$

### Eliminando producciones lambda

$$Anul1 = \{D\}$$
$$Anul2 = \{D\} \cup \{\epsilon\} = \{D\}$$
$$S \rightarrow SS \mid SBB \mid CCE$$
$$A \rightarrow aE \mid bE$$
$$B \rightarrow bB \mid Db \mid b$$
$$C \rightarrow aC \mid bB$$
$$D \rightarrow aDb \mid ab$$
$$E \rightarrow aA \mid bB$$

### Eliminando producciones unitarias

$$\text{Unit}(S) = \{S\}$$
$$\text{Unit}(A) = \{A\}$$
$$\text{Unit}(B) = \{B\}$$
$$\text{Unit}(C) = \{C\}$$
$$\text{Unit}(D) = \{D\}$$
$$\text{Unit}(E) = \{E\}$$
$$S \rightarrow SS \mid SBB \mid CCE$$
$$A \rightarrow aE \mid bE$$
$$B \rightarrow bB \mid Db \mid b$$
$$C \rightarrow aC \mid bB$$
$$D \rightarrow aDb \mid ab$$
$$E \rightarrow aA \mid bB$$

### Eliminando las no terminales

$$\text{Term1} = \{D\}$$
$$\text{Term2} = \{D\} \cup \{B\}$$
$$\text{Term3} = \{D, B\} \cup \{E\}$$

$\text{Term4} = \{D, B, E\} \cup \{C\}$   
 $\text{Term5} = \{D, B, E, C\} \cup \{A\}$   
 $\text{Term6} = \{D, B, E, C, A\} \cup \{S\} = \{D, B, E, C, A, S\}$   
 $\text{NoTerm} = \{\}$   
 $S \rightarrow SS \mid SBB \mid CCE$   
 $A \rightarrow aE \mid bE$   
 $B \rightarrow bB \mid Db \mid b$   
 $C \rightarrow aC \mid bB$   
 $D \rightarrow aDb \mid ab$   
 $E \rightarrow aA \mid bB$

### Eliminando las no alcanzables

$\text{Alc1} = \{S\}$   
 $\text{Alc2} = \{S\} \cup \{B\} = \{S, B\}$   
 $\text{Alc3} = \{S, B\} \cup \{D\} = \{S, B, D\}$   
 $\text{Alc4} = \{S, B, D\} \cup \{C\} = \{S, B, D, C\}$   
 $\text{Alc5} = \{S, B, D, C\} \cup \{E\} = \{S, B, D, C, E\}$   
 $\text{Alc6} = \{S, B, D, C, E\} \cup \{A\} = \{S, B, D, C, E, A\}$   
 $\text{NoAlc} = \{\}$

$S \rightarrow SS \mid SBB \mid CCE$   
 $A \rightarrow aE \mid bE$   
 $B \rightarrow bB \mid Db \mid b$   
 $C \rightarrow aC \mid bB$   
 $D \rightarrow aDb \mid ab$   
 $E \rightarrow aA \mid bB$

2.

$S \rightarrow EA \mid SaBb \mid aEb$   
 $A \rightarrow DaD \mid bD$   
 $B \rightarrow bB \mid Ab \mid n$   
 $C \rightarrow aC \mid bBC$   
 $D \rightarrow aEb \mid ab$   
 $E \rightarrow aA \mid bB \mid n$   
 $F \rightarrow Fb \mid Fa \mid a$

### Eliminando producciones lambda

$\text{Anul1} = \{B\}$   
 $\text{Anul2} = \{B\} \cup \{E\} = \{B, E\}$

$S \rightarrow EA \mid SaBb \mid aEb \mid A \mid Sab \mid ab$   
 $A \rightarrow DaD \mid bD$   
 $B \rightarrow bB \mid Ab \mid b$   
 $C \rightarrow aC \mid bBC \mid bC$   
 $D \rightarrow aEb \mid ab$

$E \rightarrow aA \mid bB \mid b$   
 $F \rightarrow Fb \mid Fa \mid a$

### Eliminando producciones unitarias

$\text{Unit}(S) = \{S, A\}$   
 $\text{Unit}(A) = \{A\}$   
 $\text{Unit}(B) = \{B\}$   
 $\text{Unit}(C) = \{C\}$   
 $\text{Unit}(D) = \{D\}$   
 $\text{Unit}(E) = \{E\}$   
 $\text{Unit}(F) = \{F\}$

$S \rightarrow EA \mid SaBb \mid aEb \mid DaD \mid bD \mid Sab \mid ab$   
 $A \rightarrow DaD \mid bD$   
 $B \rightarrow bB \mid Ab \mid b$   
 $C \rightarrow aC \mid bBC \mid bC$   
 $D \rightarrow aEb \mid ab$   
 $E \rightarrow aA \mid bB \mid b$   
 $F \rightarrow Fb \mid Fa \mid a$

### Eliminando las no terminales

$\text{Term1} = \{F\}$   
 $\text{Term2} = \{F\} \cup \{E\}$   
 $\text{Term3} = \{F, E\} \cup \{D\}$   
 $\text{Term4} = \{F, E, D\} \cup \{A\}$   
 $\text{Term5} = \{F, E, D, A\} \cup \{S\} = \{F, E, D, A, S\}$   
 $\text{NoTerm} = \{C\}$

$S \rightarrow EA \mid SaBb \mid aEb \mid DaD \mid bD \mid Sab \mid ab$   
 $A \rightarrow DaD \mid bD$   
 $B \rightarrow bB \mid Ab \mid b$   
 $D \rightarrow aEb \mid ab$   
 $E \rightarrow aA \mid bB \mid b$   
 $F \rightarrow Fb \mid Fa \mid a$

### Eliminando las no alcanzables

$\text{Alc1} = \{S\}$   
 $\text{Alc2} = \{S\} \cup \{E\}$   
 $\text{Alc3} = \{S, E\} \cup \{A\}$   
 $\text{Alc4} = \{S, E, A\} \cup \{D\}$   
 $\text{Alc5} = \{S, E, A, D\} \cup \{B\}$   
 $\text{Alc6} = \{S, E, A, D, B\} \cup \{\} = \{S, E, A, D, B\}$   
 $\text{NoAlc} = \{F\}$

$S \rightarrow EA \mid SaBb \mid aEb \mid DaD \mid bD \mid Sab \mid ab$

$A \rightarrow DaD \mid bD$   
 $B \rightarrow bB \mid Ab \mid b$   
 $D \rightarrow aEb \mid ab$   
 $E \rightarrow aA \mid bB \mid b$

3.

$S \rightarrow BCB$   
 $A \rightarrow aA \mid ab$   
 $B \rightarrow bBa \mid A \mid DC$   
 $C \rightarrow aCb \mid D \mid b$   
 $D \rightarrow aB \mid n$

### Eliminando producciones lambda

$Anul1 = \{D\}$   
 $Anul2 = \{D\} \cup \{C\}$   
 $Anul3 = \{D,C\} \cup \{B\}$   
 $Anul4 = \{D,C,B\} \cup \{S\} = \{D,C,B,S\}$

$S \rightarrow BCB \mid CB \mid BC \mid BB \mid B \mid C$   
 $A \rightarrow aA \mid ab$   
 $B \rightarrow bBa \mid A \mid DC \mid ba \mid D \mid C$   
 $C \rightarrow aCb \mid D \mid ab \mid b$   
 $D \rightarrow aB \mid a$

### Eliminando producciones unitarias

$Unit(S) = \{S, B, C, A, D\}$   
 $Unit(A) = \{A\}$   
 $Unit(B) = \{B,A,D,C\}$   
 $Unit(C) = \{C,D\}$   
 $Unit(D) = \{D\}$

$S \rightarrow BCB \mid CB \mid BC \mid BB \mid bBa \mid aA \mid ab \mid DC \mid ba \mid aB \mid a \mid aCb \mid aB \mid b$   
 $A \rightarrow aA \mid ab$   
 $B \rightarrow bBa \mid aA \mid ab \mid DC \mid ba \mid aB \mid a \mid aCb \mid b$   
 $C \rightarrow aCb \mid aB \mid a \mid ab \mid b$   
 $D \rightarrow aB \mid a$

### Eliminando las no terminales

$Term1 = \{D\}$   
 $Term2 = \{D\} \cup \{C\}$   
 $Term3 = \{D,C\} \cup \{B\}$   
 $Term4 = \{D,C,B\} \cup \{A\}$

$\text{Term5} = \{D, C, B, A\} \cup \{S\} = \{D, C, B, A, S\}$

$\text{NoTerm} = \{\}$

$S \rightarrow BCB \mid CB \mid BC \mid BB \mid bBa \mid aA \mid ab \mid DC \mid ba \mid aB \mid a \mid aCb \mid aB \mid b$

$A \rightarrow aA \mid ab$

$B \rightarrow bBa \mid aA \mid ab \mid DC \mid ba \mid aB \mid a \mid aCb \mid b$

$C \rightarrow aCb \mid aB \mid a \mid ab \mid b$

$D \rightarrow aB \mid a$

### Eliminando las no alcanzables

$\text{Alc1} = \{S\}$

$\text{Alc2} = \{S\} \cup \{B\}$

$\text{Alc3} = \{S, B\} \cup \{A\}$

$\text{Alc4} = \{S, B, A\} \cup \{C\}$

$\text{Alc4} = \{S, B, A, C\} \cup \{D\} = \{S, B, A, C, D\}$

$\text{NoAlc} = \{\}$

$S \rightarrow BCB \mid CB \mid BC \mid BB \mid bBa \mid aA \mid ab \mid DC \mid ba \mid aB \mid a \mid aCb \mid b$

$A \rightarrow aA \mid ab$

$B \rightarrow bBa \mid aA \mid ab \mid DC \mid ba \mid aB \mid a \mid aCb \mid b$

$C \rightarrow aCb \mid aB \mid a \mid ab \mid b$

$D \rightarrow aB \mid a$

4.

$S \rightarrow EA \mid SaBb \mid aEb$

$A \rightarrow DaD \mid bD \mid BEB$

$B \rightarrow bB \mid Ab \mid n$

$D \rightarrow aEb \mid ab$

$E \rightarrow aA \mid bB \mid n$

### Eliminando producciones lambda

$\text{Anul1} = \{E\}$

$\text{Anul2} = \{E\} \cup \{B\}$

$\text{Anul3} = \{E, B\} \cup \{A\}$

$\text{Anul4} = \{E, B, A\} \cup \{S\} = \{E, B, A, S\}$

$S \rightarrow EA \mid SaBb \mid aEb \mid E \mid A \mid aBb \mid Sab \mid ab$

$A \rightarrow DaD \mid bD \mid BEB \mid BE \mid EB \mid BB \mid E \mid B$

$B \rightarrow bB \mid Ab \mid b$

$D \rightarrow aEb \mid ab$

$E \rightarrow aA \mid bB \mid a \mid b$

### Eliminando producciones unitarias

$\text{Unit}(S) = \{S, A, E, B\}$

$\text{Unit}(A) = \{E, B\}$

$\text{Unit}(B) = \{B\}$

$\text{Unit}(D) = \{D\}$

$\text{Unit}(E) = \{E\}$

$S \rightarrow EA \mid SaBb \mid aEb \mid aA \mid bB \mid b \mid DaD \mid bD \mid BEB \mid BE \mid EB \mid BB \mid bB \mid Ab \mid aBb \mid Sab \mid ab$

$A \rightarrow DaD \mid bD \mid BEB \mid BE \mid EB \mid BB \mid aA \mid bB \mid a \mid b \mid bB \mid Ab$

$B \rightarrow bB \mid Ab \mid b$

$D \rightarrow aEb \mid ab$

$E \rightarrow aA \mid bB \mid a \mid b$

### Eliminando las no terminales

$\text{Term1} = \{E\}$

$\text{Term2} = \{E\} \cup \{D\}$

$\text{Term3} = \{E, D\} \cup \{B\}$

$\text{Term4} = \{E, D, B\} \cup \{A\}$

$\text{Term5} = \{E, D, B, A\} \cup \{S\} = \{E, D, B, A, S\}$

$\text{NoTerm} = \{\}$

$S \rightarrow EA \mid SaBb \mid aEb \mid aA \mid bB \mid b \mid DaD \mid bD \mid BEB \mid BE \mid EB \mid BB \mid bB \mid Ab \mid aBb \mid Sab \mid ab$

$A \rightarrow DaD \mid bD \mid BEB \mid BE \mid EB \mid BB \mid aA \mid bB \mid a \mid b \mid bB \mid Ab$

$B \rightarrow bB \mid Ab \mid b$

$D \rightarrow aEb \mid ab$

$E \rightarrow aA \mid bB \mid a \mid b$

### Eliminando las no alcanzables

$\text{Alc1} = \{S\}$

$\text{Alc2} = \{S\} \cup \{A\}$

$\text{Alc3} = \{S, A\} \cup \{B\}$

$\text{Alc4} = \{S, A, B\} \cup \{D\}$

$\text{Alc5} = \{S, A, B, D\} \cup \{E\}$

$\text{NoAlc} = \{\}$

$S \rightarrow EA \mid SaBb \mid aEb \mid aA \mid bB \mid b \mid DaD \mid bD \mid BEB \mid BE \mid EB \mid BB \mid bB \mid Ab \mid aBb \mid Sab \mid ab$

$A \rightarrow DaD \mid bD \mid BEB \mid BE \mid EB \mid BB \mid aA \mid bB \mid a \mid b \mid bB \mid Ab$

$B \rightarrow bB \mid Ab \mid b$

$D \rightarrow aEb \mid ab$

$E \rightarrow aA \mid bB \mid a \mid b$

5.

$S \rightarrow Ba \mid A \mid n$

$A \rightarrow Aa \mid a$

$B \rightarrow bB \mid S$

### Eliminando producciones lambda

$\text{Anul1} = \{S\}$

$$\text{Anul2} = \{S\} \cup \{B\} = \{S, B\}$$

$$S \rightarrow Ba \mid A \mid a$$

$$A \rightarrow Aa \mid a$$

$$B \rightarrow bB \mid S \mid b$$

**Eliminando producciones unitarias**

$$\text{Unit}(S) = \{S, A\}$$

$$\text{Unit}(A) = \{A\}$$

$$\text{Unit}(B) = \{B, S, A\}$$

$$S \rightarrow Ba \mid Aa \mid a$$

$$A \rightarrow Aa \mid a$$

$$B \rightarrow bB \mid Ba \mid Aa \mid a \mid b$$

**Eliminando las no terminales**

$$\text{Term1} = \{B\}$$

$$\text{Term2} = \{B\} \cup \{A\}$$

$$\text{Term3} = \{B, A\} \cup \{S\} = \{B, A, S\}$$

$$\text{NoTerm} = \{\}$$

$$S \rightarrow Ba \mid Aa \mid a$$

$$A \rightarrow Aa \mid a$$

$$B \rightarrow bB \mid Ba \mid Aa \mid a \mid b$$

**Eliminando las no alcanzables**

$$\text{Alc1} = \{S\}$$

$$\text{Alc2} = \{S\} \cup \{B\}$$

$$\text{Alc3} = \{S, B\} \cup \{A\} = \{S, B, A\}$$

$$\text{NoAlc} = \{\}$$

$$S \rightarrow Ba \mid Aa \mid a$$

$$A \rightarrow Aa \mid a$$

$$B \rightarrow bB \mid Ba \mid Aa \mid a \mid b$$

6.

$$S \rightarrow BBa \mid A \mid B \mid ab \mid \lambda$$

$$A \rightarrow Aa \mid B \mid D \mid aC$$

$$B \rightarrow bB \mid aA \mid b$$

$$C \rightarrow ABb \mid A \mid aB$$

$$D \rightarrow cC \mid c$$

**Eliminando producciones lambda**

$$\text{Anul1} = \{S\}$$

$S \rightarrow BBa \mid A \mid B \mid ab$

$A \rightarrow Aa \mid B \mid D \mid aC$

$B \rightarrow bB \mid aA \mid b$

$C \rightarrow ABb \mid A \mid aB$

$D \rightarrow cC \mid c$

### **Eliminando producciones unitarias**

$\text{Unit}(S) = \{S, A, B, D\}$

$\text{Unit}(A) = \{A, B, D\}$

$\text{Unit}(B) = \{B\}$

$\text{Unit}(C) = \{C, A, B, D\}$

$\text{Unit}(D) = \{D\}$

$S \rightarrow BBa \mid Aa \mid bB \mid aA \mid b \mid cC \mid c \mid aC \mid ab$

$A \rightarrow Aa \mid bB \mid aA \mid b \mid cC \mid c \mid aC$

$B \rightarrow bB \mid aA \mid b$

$C \rightarrow ABb \mid Aa \mid bB \mid aA \mid b \mid cC \mid c \mid aC \mid aB$

$D \rightarrow cC \mid c$

### **Eliminando las no terminales**

$\text{Term1} = \{D\}$

$\text{Term2} = \{D\} \cup \{C\}$

$\text{Term3} = \{D, C\} \cup \{B\}$

$\text{Term4} = \{D, C, B\} \cup \{A\}$

$\text{Term5} = \{D, C, B, A\} \cup \{S\}$

$\text{NoTerm} = \{\}$

$S \rightarrow BBa \mid Aa \mid bB \mid aA \mid b \mid cC \mid c \mid aC \mid ab$

$A \rightarrow Aa \mid bB \mid aA \mid b \mid cC \mid c \mid aC$

$B \rightarrow bB \mid aA \mid b$

$C \rightarrow ABb \mid Aa \mid bB \mid aA \mid b \mid cC \mid c \mid aC \mid aB$

$D \rightarrow cC \mid c$

### **Eliminando las no alcanzables**

$\text{Alc1} = \{S\}$

$\text{Alc2} = \{S\} \cup \{A\}$

$\text{Alc3} = \{S, A\} \cup \{B\}$

$\text{Alc4} = \{S, A, B\} \cup \{C\} = \{S, A, B, C\}$

$\text{NoAlc} = \{D\}$

$S \rightarrow BBa \mid Aa \mid bB \mid aA \mid b \mid cC \mid c \mid aC \mid ab$

$A \rightarrow Aa \mid bB \mid aA \mid b \mid cC \mid c \mid aC$

$B \rightarrow bB \mid aA \mid b$

$C \rightarrow ABb \mid Aa \mid bB \mid aA \mid b \mid cC \mid c \mid aC \mid aB$



7.

$S \rightarrow ACA \mid ab \mid B \mid CA \mid A \mid C \mid \lambda$

$A \rightarrow aAa \mid B \mid CD \mid aa \mid D$

$B \rightarrow bB \mid bA \mid b$

$C \rightarrow cC \mid c$

$D \rightarrow ABb \mid ac \mid C \mid Bb$

### Eliminando producciones lambda

$Anul1 = \{S\}$

$S \rightarrow ACA \mid ab \mid B \mid CA \mid A \mid C$

$A \rightarrow aAa \mid B \mid CD \mid aa \mid D$

$B \rightarrow bB \mid bA \mid b$

$C \rightarrow cC \mid c$

$D \rightarrow ABb \mid ac \mid C \mid Bb$

### Eliminando producciones unitarias

$Unit(S) = \{S, A, B, C, D\}$

$Unit(A) = \{A, B, D, C\}$

$Unit(B) = \{B\}$

$Unit(C) = \{C\}$

$Unit(D) = \{D, C\}$

$S \rightarrow ACA \mid ab \mid bB \mid bA \mid b \mid CA \mid aAa \mid CD \mid aa \mid ABb \mid ac \mid cC \mid c \mid Bb$

$A \rightarrow aAa \mid bB \mid bA \mid b \mid CD \mid aa \mid ABb \mid ac \mid cC \mid c \mid Bb$

$B \rightarrow bB \mid bA \mid b$

$C \rightarrow cC \mid c$

$D \rightarrow ABb \mid ac \mid cC \mid c \mid Bb$

### Eliminando las no terminales

$Term1 = \{D\}$

$Term2 = \{D\} \cup \{C\}$

$Term3 = \{D, C\} \cup \{B\}$

$Term4 = \{D, C, B\} \cup \{A\}$

$Term5 = \{D, C, B, A\} \cup \{S\} = \{D, C, B, A, S\}$

$NoTerm = \{\}$

$S \rightarrow ACA \mid ab \mid bB \mid bA \mid b \mid CA \mid aAa \mid CD \mid aa \mid ABb \mid ac \mid cC \mid c \mid Bb$

$A \rightarrow aAa \mid bB \mid bA \mid b \mid CD \mid aa \mid ABb \mid ac \mid cC \mid c \mid Bb$

$B \rightarrow bB \mid bA \mid b$

$C \rightarrow cC \mid c$

$D \rightarrow ABb \mid ac \mid cC \mid c \mid Bb$

### Eliminando las no alcanzables

$Alc1 = \{S\}$

$Alc2 = \{S\} \cup \{A\}$

$Alc3 = \{S, A\} \cup \{B\}$

$Alc4 = \{S, A, B\} \cup \{C\}$

$Alc5 = \{S, A, B, C\} \cup \{D\} = \{S, A, B, C, D\}$

$NoAlc = \{\}$

$S \rightarrow ACA \mid ab \mid bB \mid bA \mid b \mid CA \mid aAa \mid CD \mid aa \mid ABb \mid ac \mid cC \mid c \mid Bb$

$A \rightarrow aAa \mid bB \mid bA \mid b \mid CD \mid aa \mid ABb \mid ac \mid cC \mid c \mid Bb$

$B \rightarrow bB \mid bA \mid b$

$C \rightarrow cC \mid c$

$D \rightarrow ABb \mid ac \mid cC \mid c \mid Bb$