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ICS 313
Quiz #4
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Quiz #4:

Eliminate left recursion from the following grammar:

S --> Ba | Ab
A --> Sa | AAb | a
B --> Sb | BBa | b

a. In the order of B, S, A:

B --> Sb | BBa | b
S --> Ba | Ab
A --> Sa | AAb | a

Solving…

B --> Sb | BBa | b

=> α1 = Ba
β1 = Sb
β2 = b
=> B --> Sb | b | SbP | bP
P --> Ba | BaP

S --> Ba | Ab
--> Sba | ba | SbPa | bPa | Ab

=> α1 = ba
α2 = bPa
β1 = ba
β2 = bPa
β3 = Ab

=> S --> ba | bPa | Ab | baQ | bPaQ | AbQ
Q --> ba | bPa | baQ | bPaQ

A --> Sa | AAb | a
--> baa | bPaa | Aba | baQa | bPaQa | AbQa | AAb | a

=> α1 = ba
α2 = bQa
α3 = Ab
β1 = baa
β2 = bPaa
β3 = baQa
β4 = bPaQa
β5 = a

=> A --> baa | bPaa | baQa |bPaQa | a |
baaR | bPaaR | baQaR |bPaQaR | aR
R --> ba | bQa | Ab | baR | bQaR | AbR

Solution:

B --> Sb | b | SbP | bP
P --> Ba | BaP
S --> ba | bPa | Ab | baQ | bPaQ | AbQ
Q --> ba | bPa | baQ | bPaQ
A --> baa | bPaa | baQa |bPaQa | a |
baaR | bPaaR | baQaR |bPaQaR | aR
R --> ba | bQa | Ab | baR | bQaR | AbR

b. In the order of S, A, B

S --> Ba | Ab
A --> Sa | AAb | a
B --> Sb | BBa | b

Solving...

A --> Sa | AAb | a
--> Baa | Aba | AAb | a

=> α1 = ba
α2 = Ab
β1 = Baa
β2 = a
=> A --> Baa | a | BaaP | aP
P --> ba | Ab | baP | AbP

B --> Sb | BBa | b
--> Bab | Abb | BBa | b
--> Bab | Baabb | abb | BaaPbb | aPbb | BBa | b

=> α1 = ab
α2 = aabb
α3 = aaPbb
α4 = Ba
β1 = abb
β2 = aPbb
β3 = b
=> B --> abb | aPbb | b | abbQ | aPbbQ | bQ
Q --> ab | aabb | aaPbb | abQ | aabbQ | aaPbbQ

Solution:

S --> Ba | Ab
A --> Baa | a | BaaP | aP
P --> ba | Ab | baP | AbP
B --> abb | aPbb | b | abbQ | aPbbQ | bQ
Q --> ab | aabb | aaPbb | abQ | aabbQ | aaPbbQ