Cos3701 Task

1. (b + a)\*a(b + a)\*a(a + b)\*

This is the language with atleast 2 a’s

1. S -> X | Y

X -> aX | ab | abX

Y -> bY | ba | baY

1. Diagram

   Description automatically generatedok
2. Diagram

   Description automatically generatedok
3. S -> aX | bS | a | b

X -> aX | a | **Λ**

Since only S -> aX and X -> aX contain the X that leads to **Λ**

**then only X -> a**

**therefore**

S -> aX | bS | a | b

X -> aX | a |

Defines the same CFG

1. S -> aXY | Z

X -> bbb | bX | aZ

Y -> aS | **Λ**

Z -> a | b | baY | **Λ**

Split

S -> aXY

S -> Z

X -> bbb

X -> bX

X -> aZ

Y -> aS

Y -> **Λ**

Z -> a

Z -> b

Z - > baY

Z -> **Λ**

Remove the **Λ**

S -> aXY

S -> Z

X -> bbb

X -> bX

X -> aZ

Y -> aS

Y -> **aX**

Y -> ba

Z -> a

Z -> b

Z - > baY

Reformulated

S -> ZXY

S -> Z

X ->  ZZZ

X -> ZX

X -> ZZ

Y -> ZS

Y -> ZX

Y -> ZZ

Z -> ZZY

Z -> a

Z -> b

Chomsky Normal Form

S -> ZR

R -> XY

X -> ZR

R -> ZZ

X -> ZX

X -> ZZ

Y -> ZS

Y -> ZZ

Y -> ZX

Z -> ZR

R -> ZY

Z -> a

Z -> b

1. S -> bS | ax

X -> bS | aY

Y -> aY | bY | a | b

A piece of paper with writing on it

Description automatically generated with medium confidence

b\*a(b\*a)\*a(a + b)\*

The language of the first 2 b’s having an a after them. It also has at least 2 a’s.

1. Diagram, schematic

   Description automatically generated