Useless symbols Removal

① Non-Generating - A symbol X is generating if $X \overset{*}{\underset{G}{\Rightarrow}} w$ in one step or in multiple steps. $(X \in V)$

Rules

① Every symbol in T is generating. ie {a, b}

② If production $A \to \alpha$ where $\alpha = (V \cup T)^*$ if every symbol in α is generating then A is also generating

③ Repeat this process for all V.

④ A symbol not in that set is non-generating.

② Non-Reachable symbols - A symbol that is never reachable from S directly or indirectly is NON-reachable.

* Plot a graph by putting nodes as all variables. Try to join them using edges if a particular rule is there. Node remaining unconnected/not reachable from S is non reachable

(2) $S \to aC \mid SB$

(2) $A \to aSCa$

$B \to aSB \mid bBC$

$C \to aBC \mid ad$

(1) Generating symbols

$\{ a \ b \ d \}$

$\downarrow C \to ad$

$\{ C, a, b, d \}$

$\downarrow S \to aC$

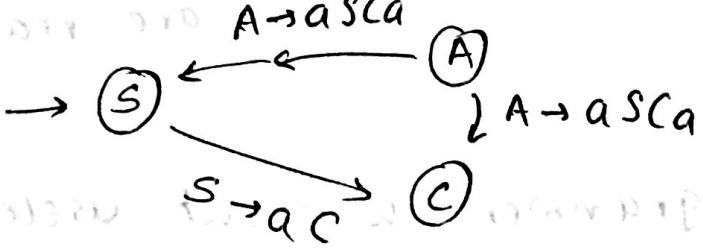
$\{ S, C, a, b, d \}$

$\downarrow A \to aSCa$

$\{ A, S, C, a, b, d \}$

symbol B is not generating.

(2) Non-Reaching symbols



$S \to aC$

$A \to aSCa$

$C \to ad$

A is non-reachable

so Grammer without useless symbol is

$S \to aC$

$C \to ad.$