

الف)

$S \rightarrow aSb \mid bAc$
 $A \rightarrow cS \mid B$
 $B \rightarrow Cab \mid bD \mid \lambda$
 $C \rightarrow BB \mid AD \mid a$
 $D \rightarrow bDb$

بهمت حذف D و حذف و
 nullable variable
 X حرف
 use less production

$S \rightarrow aSb \mid bAc$
 $A \rightarrow cS \mid B \mid \lambda$
 $B \rightarrow Cab$
 $C \rightarrow \lambda \mid a \mid BB$

nullable variable

$\Rightarrow \begin{cases} S \rightarrow aSb \mid bc \mid bAc \\ A \rightarrow cS \mid B \\ B \rightarrow ab \mid Cab \\ C \rightarrow a \mid BB \end{cases}$

ب)

$S \rightarrow aA \mid bBba$
 $A \rightarrow ABc \mid bBa$
 $B \rightarrow DeD \mid b$
 $C \rightarrow Ddc \mid eaC$
 $D \rightarrow Ebd \mid c \mid \lambda$
 $E \rightarrow eEe \mid D$
 $F \rightarrow abC \mid d$

nullable production
 useless X حرف

$S \rightarrow aA \mid bBba$
 $A \rightarrow ABc \mid bBa$
 $B \rightarrow DeD \mid b \mid e$
 $C \rightarrow Ddc \mid d \mid eaC$
 $D \rightarrow Ebd \mid c$
 $E \rightarrow eEe \mid D \mid \lambda$

nullable production
 X جایگزین برای حذف

PAPCO

از S حذف