Part II

Total 40 points

(10)

1. Using the method discussed in class, convert the following CFG to one in Chomsky Normal Form. Show every step.

$G = (\{S,X\}, [a,b\}, \{S \rightarrow bX,\ X \rightarrow XaX \mid \varepsilon\ \}, S)$

(10)

2. Using the method discussed in class, for the following CFG G, write an equivalent CFG G' such that G' does not contain unit productions. Show every step, including how to get UNIT sets.

G = ({S,A,B,W,X,Y,Z}, {a,b}, P, S), where

P = { $S \rightarrow XY$, $A \rightarrow aA \mid bA \mid a \mid b$, $B \rightarrow Ba \mid Bb \mid a \mid b$, $W \rightarrow Z$,
$X \rightarrow Zb \mid b$, $Y \rightarrow bW \mid b$, $Z \rightarrow AB \mid A \mid B$ }

(10)

3. Using the method discussed in class, construct a CFG G" which is equivalent to the following CFG G' and does not have useless symbols. Show every step, including how to get REACH set and so on.

G = (V, Σ, P, S), where V = {S,A,B,C,D,U,V,W,X,Y},

Σ = {a,b,c,d,e,f,g,h,i,j,k,m,n,o},

P = { $S \rightarrow gAe \mid aYB \mid CY$, $A \rightarrow bBY \mid ooC$, $B \rightarrow dd \mid D$, $C \rightarrow jVB \mid gi$,
$D \rightarrow n$, $U \rightarrow kW$, $V \rightarrow baXXX \mid oV$, $W \rightarrow c$, $X \rightarrow fV$, $Y \rightarrow Yhm$}.