

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.

$G = (V, \Sigma, P, S)$, where $V = \{S, A, B, C, D, U, V, W, X, Y\}$,
 $\Sigma = \{a, b, c, d, e, f, g, h, i, j, k, m, n, o\}$,
 $P = \{ S \rightarrow gAe \mid aYB \mid CY, A \rightarrow bBY \mid ooC, B \rightarrow dd \mid D, C \rightarrow jVB \mid gi, \\ D \rightarrow n, U \rightarrow kW, V \rightarrow baXXX \mid oV, W \rightarrow c, X \rightarrow fV, Y \rightarrow Yhm \}$.