

# Practice

## Converting CFG to CNF

1.

$S \rightarrow ASB$   
 $A \rightarrow aAS \mid a \mid \varepsilon$   
 $B \rightarrow SbS \mid A \mid bb$

3.

$S \rightarrow aXbY$   
 $X \rightarrow aX \mid \varepsilon$   
 $Y \rightarrow bY \mid \varepsilon$

5.

$S \rightarrow S_1 \mid S_2$   
 $S_1 \rightarrow S_1b \mid Ab \mid \varepsilon$   
 $A \rightarrow aAb \mid ab$   
 $S_2 \rightarrow S_2a \mid Ba \mid \varepsilon$   
 $B \rightarrow bBa \mid ba$

7.

$S \rightarrow aX \mid bY \mid b \mid ZZc$   
 $X \rightarrow Yaa \mid abZ \mid \varepsilon$   
 $Y \rightarrow bXXb \mid ab \mid cZ$   
 $Z \rightarrow a \mid b \mid XZ \mid \varepsilon$

2.

$S \rightarrow XY$   
 $X \rightarrow abb \mid aXb \mid \varepsilon$   
 $Y \rightarrow c \mid cY$

4.

$S \rightarrow aXbX$   
 $X \rightarrow aY \mid bY \mid \varepsilon$   
 $Y \rightarrow X \mid c$

6.

$S \rightarrow DBC \mid Ba$   
 $B \rightarrow 0B1 \mid 01 \mid \varepsilon$   
 $C \rightarrow aCb \mid aC \mid Bb$   
 $D \rightarrow bD \mid D$

8.

$A \rightarrow BAB \mid B \mid \varepsilon$   
 $B \rightarrow 00 \mid \varepsilon$