

Student ID :  
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**Automata Theory Course Quiz-2 (2016-2017Fall)**  
(Please use free space for draft and fit your answer to boxes.)

1. (50P) Find whether given grammar can produce "bbbaaababa" or not.  
( $S \rightarrow bS|A$ ,  $A \rightarrow aA|aAa|B$ ,  $B \rightarrow bBb|A$ )

The first, enumerate the rules:

1)  $S \rightarrow bS$  2)  $S \rightarrow A$  3)  $A \rightarrow aA$  4)  $A \rightarrow aAa$  5)  $A \rightarrow B$  6)  $B \rightarrow bBb$  7)  $B \rightarrow A$

The second, start with initial variable S

1   1   1   2   3   3   4   5  
 $S \rightarrow bS \rightarrow bbS \rightarrow bbbS \rightarrow bbbA \rightarrow bbbAa \rightarrow bbbAaA \rightarrow bbbAaAa \rightarrow bbbAaABa$

6   7   3  
 $\rightarrow bbbAaABba \rightarrow bbbAaABaA \rightarrow bbbAaABaAba$

We could produce it, but since there is not a stop rule, we cannot stop the system. So it is not an absolute solution.

2. (50P) According to grammar below, write PDA functions down.  
( $S \rightarrow AB|\epsilon$ ,  $A \rightarrow a|AB|AA$ ,  $B \rightarrow b|BA$ )

The first, enumerate the rules:

R1)  $S \rightarrow AB$  R2)  $S \rightarrow \epsilon$  R3)  $A \rightarrow a$  R4)  $A \rightarrow AB$  R5)  $A \rightarrow AA$  R6)  $B \rightarrow b$  R7)  $B \rightarrow BA$

According to the first type of rules ( $X \rightarrow XY$ )

$qa\$ \rightarrow qNBA$  for R1  
 $qb\$ \rightarrow qNBA$  for R1  
 $qaA \rightarrow qNBA$  for R4  
 $qbA \rightarrow qNBA$  for R4  
 $qaA \rightarrow qNAA$  for R5  
 $qbA \rightarrow qNAA$  for R5  
 $qaB \rightarrow qNAB$  for R7  
 $qbB \rightarrow qNAB$  for R7

According to the second type of rules ( $X \rightarrow x$ )

$qaA \rightarrow qR\epsilon$  for R3  
 $qbB \rightarrow qR\epsilon$  for R6

According to the third type of rules ( $S \rightarrow \epsilon$ )

$q\#\$ \rightarrow qN\epsilon$  for R2