

# THEORY OF AUTOMATA AND FORMAL LANGUAGES

(BCSC0011)

Module-2

Practice Sheet

Ques 1. What languages are generated by the CFG which have the following productions?

1.  $S \rightarrow aSa \mid bSb \mid \lambda$
2.  $S \rightarrow aSa \mid bSb \mid a \mid b$
3.  $S \rightarrow aS \mid bS \mid \lambda$
4.  $S \rightarrow aS \mid bS \mid a$
5.  $S \rightarrow SS \mid bS \mid a$

Ques 2. Consider G whose productions are

$S \rightarrow aAS \mid a, A \rightarrow SbA \mid SS \mid ba.$

Show that  $S \Rightarrow aabbba$

Construct a derivation tree whose yield is aabbba.

Ques 3.

Let  $G$  be the grammar  $S \rightarrow 0B \mid 1A, A \rightarrow 0 \mid 0S \mid 1AA, B \rightarrow 1 \mid 1S \mid 0BB$ . For the string 00110101, find (a) the leftmost derivation, (b) the rightmost derivation, and (c) the derivation tree.

Ques 4.

Consider the grammar  $G$  with production rules –

$S \rightarrow S+S \mid S*S \mid S \mid a$

Find two Left Most Derivations of the string "a+a\*a"

Ques 5.

Remove null production from the following:-

$S \rightarrow ASA \mid aB \mid b, A \rightarrow B, B \rightarrow b \mid \lambda$

Ques 6. Eliminate null productions:

$S \rightarrow ABAC$

$A \rightarrow aA \mid \lambda$

$B \rightarrow bB \mid \lambda$

$C \rightarrow c$

Ques 7. Eliminate null productions:

$S \rightarrow aSb \mid aAb \mid ab \mid a$

$A \rightarrow \lambda$

Ques 8. Eliminate unit productions:

$S \rightarrow Aa \mid B$

$A \rightarrow b \mid B$

$B \rightarrow A \mid a$

Ques 9. Eliminate unit productions:

$E \rightarrow E+T \mid T, T \rightarrow T * F \mid F, F \rightarrow (E) \mid a$