University of Moratuwa
Faculty of Information Technology
B.Sc in Information Technology and
B.Sc in Information Technology and Management
Level 3 Semester 1
CM 3211 –Automata Theory
Tutorial 06

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1. Express in natural English the language generated by the following context-free grammars.

(a) G = = $(V, \sum, R, S)$, where
$V = \{a, b, S\}$,
$\sum = \{a, b\}$,
$R = \{S \rightarrow e,\ S \rightarrow a,\ S \rightarrow b,\ S \rightarrow aSa,\ S \rightarrow bSb\ \}$

(b) G = = $(V, \sum, R, S)$, where
$V = \{a, b,\ S\}$,
$\sum = \{a, b\}$,
$R = \{S \rightarrow aS,\ S \rightarrow Sb,\ S \rightarrow a,\ S \rightarrow b\ \}$

2. Write the Context Free Grammars for each of the following regular expressions

(i). $(a + b)^*$

(ii). $a^*b(a + b)^*$

(iii). $(a + b)^*aa(a + b)^*$

3. Construct context free grammars to generate each of the following languages.

(i). Strings having equal number of a's and b's

(ii). String having any combination of a's and b's, except null string

(iii). $\{ww^R \mid w \in \{0,1\}^*\}$