University of Technology
Department of Computer Science
Final Exam 2005-2006

Examiner: Dr. Raghad Saleem **Class: Second**
Subject: Computation Theory **Time: 3 hrs**

Q1. (A). Write a regular expression and a CFG for the following languages over the alphabet $\Sigma = \{0,1\}$ (select four only): (12 marks)

1- The language of all wards that have an even number of 0's
2- The language of all wards that have the substring 0110.
3- The language of all wards of odd lengths.
4- The language of all possible strings.
5- The language contains all the strings of 0's and 1's in which all 1's (if any) comes before 0's (if any).

(B). Draw a DFA for the languages accepted by the following regular expressions: (Select two only): (5 marks)

1. $(a+b)((a+b)(a+b))^*$.
2. $((a+b)a)^*$.
3. $(a+b)^*a(\Lambda+bbbb)$.

(C). Decide whether or not the following CFG generate any word: (5 marks)

$S \rightarrow aXX \qquad X \rightarrow aS \mid bS \mid a$

Q2. (A). Draw a PDA for the following CFG: (5 marks)

$S \rightarrow aXX \mid \Lambda \qquad X \rightarrow aS \mid bS \mid a$

(B). Draw the total language tree for the following CFG: (6.5 marks)

$S \rightarrow Xa \mid bX \mid aXaX \qquad X \rightarrow a \mid b$

(C). Drive the word=<u>abba</u> from the following CFG: (5 marks)

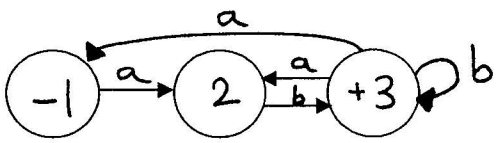
$S \rightarrow AA \qquad A \rightarrow aB \qquad B \rightarrow bB \mid \Lambda$

Q3. (A). Use the CYK table to decide whether or not the word=<u>aba</u> is generated by the following CFG: (6.5 marks) $S \rightarrow aX \qquad X \rightarrow aX \mid bX \mid \Lambda$

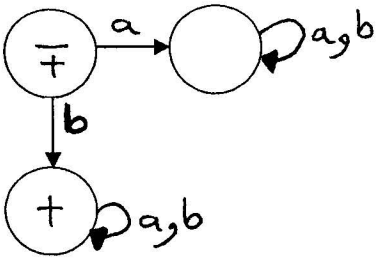
(B). Convert the following CFGs to GNFs (Select tow only): (15 marks)

1. $S \rightarrow AX \mid BX \qquad X \rightarrow XX \mid a \mid b \qquad A \rightarrow a \qquad B \rightarrow b$
2. $S \rightarrow SS \mid aXb \qquad X \rightarrow ba \mid bba \mid abb$
3. $S \rightarrow aX \mid bY \qquad X \rightarrow Sa \qquad Y \rightarrow bY \mid b \mid \Lambda$

(C). Convert the following NFA to DFA: (5 marks)



(D). Convert the following DFA to PDA: (5 marks)



GOOD LUCK