University of Technology
Computer Science Department
Class: **second Year**
Time: **3 Hours**

Branch: **Softwares**
Subject: **computation Theory**
Examiner: **Dr. Suhad M. Kadhem**

Final Exam / First Trail / 2010-2011

Note: Ten marks for each question.

Q1.

A. Find a *regular expression* (RE) that defines the language of all words with exactly two b's or three b's.

B. Build a *finite automata* (FA) that accepts only those words that do not end with ba.

Q2. Build a *Turing machine* (TM) that accepts the language:

$L=\{a^n c^{2n} b^n : n>=0\}$.

Q3. Build a *Mealy machine* that can increment the input by one, such as if your input is 1011 then the output will be 1100, then convert it to *Moore machine*.

Q4. Convert the following CFG to CNF:

$S \rightarrow aAb \mid bAa$

$A \rightarrow XY \mid bAaA$

$X \rightarrow bbY \mid Y$

$Y \rightarrow aa \mid bb \mid \Lambda$

Q5. Build *pushdown automata* (PDA) for the language:

$L=\{a^m b^n c^k a^{2n} : m>=1, n,k>=0\}$

Q6. Find CFG for each of the following : (choose only **two**)

- $L=\{a^n b^k c^{2n} : n>=0, k=2,4,6,\ldots\}$
- $RE=(a+b)^* bbb (a+b)^+$
- All words with equal number of a's and b's.

Q7. Answer only **one**:

A. Find TG for all the words with even number of a's and even number of b's then find its regular expression by using kleen's theorem.

B. If you have FA1 that accepts all words start with double a, and FA2 that accepts all words ending with **b**, build FA3 that accepts all words that start with double a **and** end with b by using *Kleen's theorem.*