

**BACHELOR OF COMPUTER SCIENCE ENGINEERING
EXAMINATION, 2011**

(4th Year, 1st Semester)

FORMAL LANGUAGE & AUTOMATA THEORY

Time : Three Hours

Full Marks - 100

Answer any **Five** questions

4. L_1, L_2 be languages accepted by NDFAs. Prove that the following languages are also accepted by NDFAs.

a) b) $L_1 L_2$ c) 6+6+8

5. Construct Push Down Automatas to accept the following languages with necessary proof :

- a)
b) $\{a^i b^j c^k : i = j \text{ or } j = k, i, j, k \geq 0\}$

In each case explain the mode of acceptance of PDA.

10+10

6. a) Prove that the language accepted by a DFA can be described by a regular expression.

- b) Develop regular expression for all strings of a, b that contain an even number of a's and even number of b's. Give necessary arguments. 10+10

7. a) Develop a grammar for the language
with necessary proof.

- b) Find out the language generated by the following grammar with necessary proof. 10+10

1. a) Construct a DFA which accepts all binary strings where every three consecutive symbols contains at least two 1's. Give necessary arguments.

- b) Let L be a language accepted by a DFA. Prove that the language $L - \{\epsilon\}$ is also accepted by a DFA. 10+10

~~$L = \{a^i b^j c^k : i = j \text{ or } j = k, i, j, k \geq 0\}$~~ Prove that for each non-deterministic finite automata, there exists an equivalent deterministic finite automata.
 $S \rightarrow bSaS$
 $S \rightarrow \epsilon$

- b) Let L be a regular language. L' be the language obtained by deleting an arbitrary number of symbols from all strings of L . Prove that L' is also regular. 15+5

3. a) State and prove the Pumping Lemma for regular languages.

- b) Let L be an infinite language. Is it possible that there is an infinite proper subset of L that is regular?

Is it possible for any infinite language, which is not regular, to have a proper infinite subset that is regular?

10+10

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