B.E/B.Tech Degree Examinations, October/November 2012

Branch: I.T **IV Semester**

IT9251 Formal Languages and Automata

Time: 3 Hours Marks:100

Part – A (10 x 2 = 20 Marks)

1. Prove that "If n is odd integer, then n^2 is odd.
2. Distinguish between DFA and NFA.
3. Write the regular expression for a language of all strings with an odd number of b's from {a,b}.
4. Write the closure properties of regular languages.
5. Define ambiguous grammar. Give an example.
6. What is Deterministic Pushdown Automata?
7. Determine the nullable variables in the grammar with productions:
   $A \rightarrow BCD$
   $B \rightarrow C$
   $D \rightarrow C$
   $C \rightarrow \varepsilon$
8. Write the formal definition of a Turing Machine.
9. Define LL(k) grammars.
10. Distinguish between top down passing and bottom up passing.

Part – B (5 x 16 = 80 Marks)

11. (i) Prove that $\sqrt{2}$ is irrational using proof by contradiction technique. (8)
    (ii) Design a finite automaton that accepts strings of 0's and 1's having even number of 0's. (8)

12. (a) (i) Design a Finite automaton to recognise the language given by the regular expression $(100 + 111)^*0$. (8)
    (ii) Show that "if L is a regular language then the language L^n is regular for every $n \geq 0$. (8)

OR

12.(b) Explain the procedure used in the minimization of finite automaton using an example. (16)

13. (a) (i) Define top down derivation and bottom up derivation. Give the leftmost and rightmost derivation for the string 00101 from the grammar.
    $S \rightarrow A1B$
    $A \rightarrow 0A|\varepsilon$
    $B \rightarrow 0B|1B|\varepsilon$ (8)

    (ii) If L_1 and L_2 are context free languages, then $L_1 \cup L_2$, $L_1.L_2$ and L^*_1 are also context free languages. (8)

OR

13.(b)(i) Design a PDA that accepts strings of palindromes of odd length with middle symbol c. (8)
(ii) Design a PDA to accept the language $L = \{ x \in \{a,b\}^* \; n_a(x) > n_b(x)\}$ given by the CFG G with productions
$S \rightarrow a|\, aS \mid bSS \mid SSb \mid SbS$ (8)

14. (a) (i) Convert the following set of productions into CNF

S→ ABC

A→ aAb| ε

B→b

C→a C| a | ε (8)

(ii) Convert the CFG with the following productions to be in GNF

S→ ABA

A→ aA| ε

B→bB/ε (8)

OR

14.(b) (i) State and prove the Pumping Lemma for CFL. (8)

(ii) Explain about Turing Machines. (8)

15. (a) (i) Explain the design of a predictive parser. (8)

(ii) How will you find FIRST ( ) and FOLLOW ( )? (8)

OR

15. (b) State and explain the LR (0) parsing algorithm. (16)