ANNA UNIVERSITY OF TECHNOLOGY, COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : NOV / DEC 2011

REGULATIONS : 2008

FIFTH SEMESTER : CSE

080230020 - FORMAL LANGUAGES AND AUTOMATA THEORY

Time : 3 Hours Max. Marks : 100

PART - A

(10 x 2 = 20 Marks)

ANSWER ALL QUESTIONS

1. Define Finite Automation? Give two examples.
2. Enumerate the Differences between DFA and NFA.
3. Verify whether $L=\{a^{2n} | n \geq 1\}$ is regular.
4. Name the operators used in describing regular expression
5. Let the production of a grammar be S→ 0B|1A, A→ 0|0S|1AA, B→ 1|1S|0BB. For the string 0110 find a right most derivation.
6. State the pumping lemma for CFG.
7. Define the languages generated by a PDA using the two methods of accepting a language.
8. Find whether the language $\{a^m b^m c^m, m \geq 0\}$ is context free or not.
9. Show that the following problem is undecidable. "Given two CFGs G1 & G2, is $L(G_1) \cap L(G_2) = \emptyset$?".
10. State two languages, which are not recursively enumerable.

PART - B

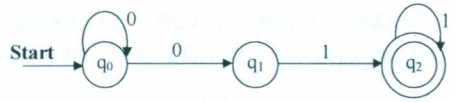
(5 x 16 = 80 Marks)

ANSWER ALL QUESTIONS

11. a) Covert the regular expression "a(a+b)*a" into ε – NFA and find the minimal state DFA.

(OR)

b) (i)Construct a DFA equivalent for the give NFA with the transition diagram. (10)



(ii)Construct a DFA that accepts all the strings on {0,1} except those containing the substring 101. (6)

12. a) (i)Find whether the languages {ww, w is in $(1+0)^*$} and $\{1^k | k=n^2, n \geq 1\}$ are regular or not. (8)

(ii)Show that the regular languages are closed under intersection and reversal. (8)

(OR)

b) Prove the following theorem: Let r be a regular expression, and then there exists an NFA with ε – transition that accepts L(r).

13. a) State the algorithm for minimization of a DFA. Construct a minimized DFA for the regular expression $(a+b)(a+b)^*$ and trace for the string **baaaab**.

(OR)

b) Explain closure properties of the Regular languages.

14. a) (i) Prove that every language recognized by a PDA is Context – free. (8)

(ii) Construct a PDA for the set of palindrome over the alphabet {a,b}. (8)

(OR)

b) (i) Construct the CFG for the following languages:

1.L(G) = $\{a^m b^n \mid m \neq n, m,n>0\}$ and (5)

2. L(G) = $\{a^n b a^n \mid n \geq 1\}$. (5)

(ii) Define Ambiguity, Left most derivation and Right most derivation with an example. (6)

15. a)Convert the following grammar into an equivalent one with no unit productions and no useless symbols. Convert to Chomsky Normal Form (CNF).

S → A | CB

A → C | D

B → 1B | 1

C → 0C | 0

D → 2D | 2

(OR)

b) (i) State and prove pumping lemma for context free languages. (10)

(ii) Using pumping lemma prove that the language $\{a^i b^i c^i \mid i \geq 1\}$ is not context free. (6)

*****THE END*****