CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

Sixth Semester of B. Tech. Examination (CE)
November 2012
CE-306 Theory of Computation (TOC)

Date: 07.11.2012, Wednesday **Time: 10:00 a.m. To 01:00 p.m.** **Maximum Marks: 70**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Rough work is to be done in the last page of main supplementary, please don't write anything on the question paper.
5. Indicate clearly, the option(s) you attempt along with its respective question no.
6. Figures to the right indicate marks.

SECTION-I

Q-1 **Answer the following questions.**

1. Prove that any regular language can be accepted by finite automata. 3
2. Give recursive definition of δ^* for FA, NFA, NFA-Λ. 3
3. Prove that: $(aa^*bb^*)^* = \Lambda + a(a+b)^*b$. 2
4. What do you mean by '*strong principle of mathematical induction*'? Give an example of a statement where you require '*strong principle of mathematical induction*'. 3

Q-2

[A] Show that the given grammar is ambiguous and find an equivalent unambiguous grammar: 4

$S \rightarrow A \mid B \quad A \rightarrow aAb \mid ab \quad B \rightarrow abB \mid \Lambda$

OR

[A] For the given regular expression, draw NFA- Λ, NFA and DFA 4

$(0+1)^*(01)^*(011)^*$

[B] Give the transition table and transition diagram for odd-length palindrome. 4

[C] Prove that the language $L = \{ 0^i1^i \mid i >= 0 \}$ is not a regular language. 4

OR

[C] Find the Regular Expression corresponding to given statement, subset of $\{0,1\}^*$ 4

1. The Language of all strings that begin and ends with 00 or 11.
2. The Language of all strings in which number of 0's is even.
3. The Language of palindromes.
4. The Language of all strings with alternate sequences of0's and 1's.

Q-3

[A] How to decide for given *FA* M, is it minimal state *FA* accepting the language *L (M)*? 4

OR

[A] Find Context Free Grammar generating following language 4

1. $0^m1^n2^p3^q$, where $m+n = p+q$
2. The set of odd length strings in $\{a,b\}^*$ whose first, middle and last symbols are all the same.

[B] Define distinguishable string with respect to L. Using it prove that language pal of palindrome is non-regular. 4

[C] Define Turing Machine. And also throw light on how it is most powerful machine as compared to DFA, NFA and PDA. 4

OR

[C] Show that if L1 and L2 are context free languages then L1 union L2 and L1 L2 and L1* are also context free languages. 4

SECTION-II

Q-4

1. Describe: Recursively Enumerable and Recursive languages. 2
2. Define equivalence relation and prove for any fixed positive integer n, the congruence Relation = n on the set N is an equivalence relation. 5
3. Let L (V T P S) be a context free grammar, define PDA 'M' such that L(M)= L(G). 4

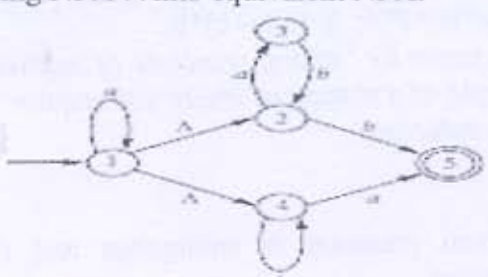
Q-5

[A] Give the transition table and transition diagram for DPDA recognizing the following grammar: 4

S→ SS |{S} |[S] |∧

[B] Write short note on: Universal Turing Machine. 4

[C] Convert the following NFA-∧ into equivalent NFA. 4



OR

Q-5

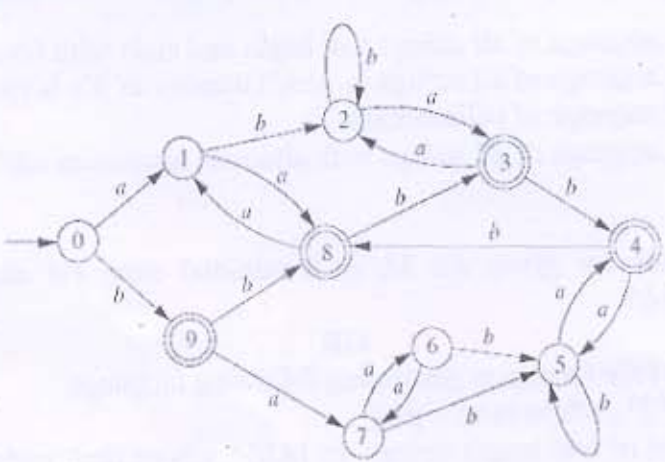
[A] Convert the following CFG and into CNF: 4

S→ aSa | bSb | ∧

A→ aBb | bBa

B→aB |bB |∧

[B] Minimize the following DFA into equivalent machine accepting same Lang. 4



[C] Find the CFG generating the following language: 4

L= $\{a^i b^j c^k \mid j=i+k\}$

Q-6

[A] Discuss: P problem, NP problem, Decision Problem and Applications of Computational Theory. 4

[B] Write a short note on the following: 4

- Derivation tree and ambiguity
- Pumping lemma for CFG

OR

[B] Check whether given Language a CFL or not. 4

$L=\{a^n b^m c^m d^n | m,n>=0\}$

[C] For each of the following regular expressions, draw FAs recognizing the corresponding language. 4

- (111+100)*0
- (0+1)* (1+00) (0+1)*

OR

[C] Describe the following concepts: 4

- Properties of an equivalence relation
- The principle of Mathematical Induction
- Distinguishable strings with respect to L
- $\wedge$-closure of a set of states