

Roll No.

Total Pages : 03

BT-5/D-23

45261

THEORY OF COMPUTATION

PC-CS-AIDS-301A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Prove the equivalence of non-deterministic finite automata and deterministic finite automata.
(b) Compare the transition functions of DFA, NFA and ϵ -NFA. 8+7=15
2. (a) Construct Regular grammar for the regular expression : $L = (a + b)^*(aa + bb)(a + b)^*$.
(b) List the closure properties of Regular sets.
(c) Briefly discuss the equivalence and minimization of NFA and DFA automata. 5+5+5=15

Unit II

3. (a) Write a note on applications of context free grammars.
(b) Convert the grammar $\{S \rightarrow ABaC \mid ABa, A \rightarrow Aa \mid a, B \rightarrow BaB \mid b, C \rightarrow CC\}$ to Chomsky normal form.

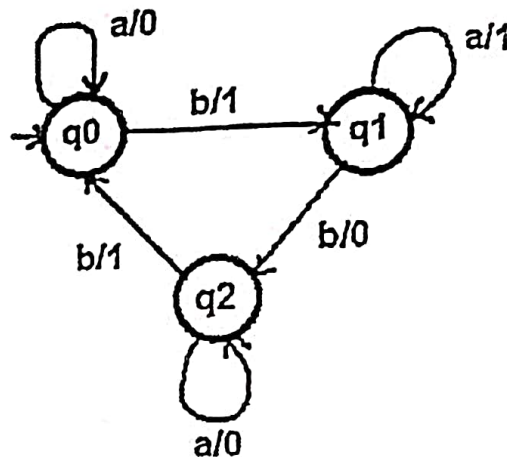
- (c) Convert to Greibach Normal form. $\{S \rightarrow AB, A \rightarrow SA \mid AA \mid a, B \rightarrow SB \mid b\}$. 5+5+5=15

4. State and prove pumping lemma for context free languages. Mention the application of pumping lemma.

15

Unit III

5. Convert the following Mealey machine in corresponding Moore machine : 15



6. (a) Prove the equivalence of push down automata and context free grammar.
- (b) Design a PDA to accept the language $\{0^{2n}1^n \mid n \geq 1\}$. 8+7=15

Unit IV

7. Define formally Turing machine Model. Explain the significance of universal Turing machine. Construct a Turing machine that recognizes the language $L = \{ a^n b^n c^n \mid n > 0 \}$. 15
8. Discuss the following : 8+7=15
- (a) Rice's theorem
 - (b) P-NP class and completeness.