

Roll No. Total Pages : 3

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BT-5/D07

AUTOMATA THEORY

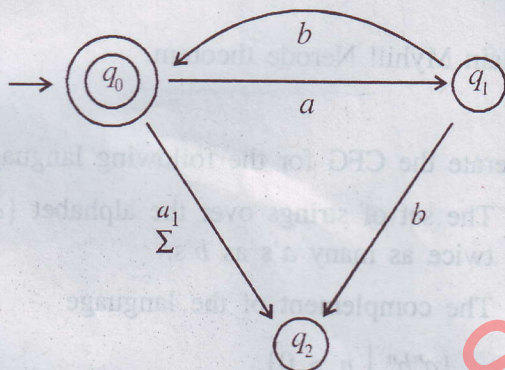
Paper – CSE-305

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt any *five* questions.

1. (a) A NFA for $L = \{a b \cup a b a\}^*$ is shown in figure below. Construct an equivalent DFA



where Σ stands for null input. 10

- (b) Construct a finite automata accepting all strings over $\{0, 1\}$
- (i) having odd number of 0's. 10
 - (ii) having even number of 0's and 1's. 10

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[P.T.O.]

2. (a) What do you mean by Regular expression ? How can you convert a NFA to regular expression ? 10
- (b) Show that the following pairs of Regular expression over $\{a, b\}$ define the same language
 $(a^* + b)^*$ and $(a + b)^*$. 10
3. (a) Construct a FSM that delays an input string 2 bits, giving 00 as the first two bits of output. 10
- (b) Explain Mealy and Moore machine. Explain the procedure to convert from Mealy to Moore and Moore to Mealy. 10
4. (a) Prove that Regular sets are closed under intersection. 10
- (b) Explain Myhill Nerode theorem. 10
5. (a) Generate the CFG for the following languages :
- (i) The set of strings over the alphabet $\{a, b\}$ with twice as many a 's as b 's.
- (ii) The complement of the language
 $\{a^n b^n \mid n \geq 0\}$. 10
- (b) For a grammar G with the productions
 $S \rightarrow a AS \mid a$
 $A \rightarrow S bA \mid SS \mid ba$
 Show that $S^* \Rightarrow a a b b a a$ and construct a derivation tree for $a a b b a a$. 10

6. (a) Convert the grammar with productions
- $$S \rightarrow a b A B$$
- $$A \rightarrow b A B \mid \lambda$$
- $$B \rightarrow B A a \mid A \mid \lambda$$
- into CNF. 10
- (b) What do you mean by Push down automata ? Explain with example. 10
7. (a) Design a TM that recognizes the set of all bit strings that contain even number of 1's. 10
- (b) Explain Post correspondence problem. 10
8. Write short notes on the following :
- (a) Chomsky hierarchy. 10
- (b) Computable functions. 10