

Roll No.

24266

B. Tech. 5th Sem.

(Computer Science & Engg.) VIII

Examination – December, 2013

THEORY OF AUTOMATA COMPUTATION

'F' Scheme

Paper : CSE-305-F

Time : Three hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

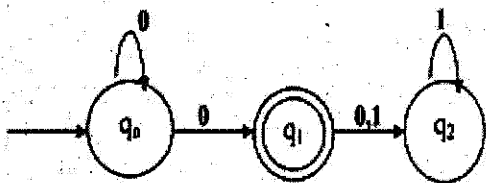
Note : Question number 1 is compulsory. Attempt one question from each section. All question carry equal marks.

1. (a) What is the need to study Automata theory? 5×4
- (b) Give the central concepts of Automata theory.
- (c) Construct an NFA for text search.
- (d) Give short notes on Finite Automata with Epsilon Transitions.

- (e) Explain right sentential form and left sentential form.

SECTION - A

2. (a) Construct a DFA with reduced states equivalent to r.e. $10 + (0 + 11) 0^* 1$. 10
- (b) Construct left linear and right linear grammars for the languages: 10
- (i) $(0 + 1)^* 00 (0 + 1)^*$
- (ii) $0^*(1(0+1))^*$
3. (a) If x and y are regular sets over Σ , then prove that $x \cap y$ is also a regular set over Σ . 10
- (b) Convert the following NFA into an equivalent DFA. 10



SECTION - B

4. (a) State Pumping Lemma and prove that $L = \{0^i 1^m \mid i \geq m\}$ is not regular. 10
- (b) State and prove Myhill Nerode theorem. 10

5. (a) Convert the grammar $G = (\{A_1, A_2, A_3\}, \{a, b\}, P, A_1)$ to GNF where P consists of the following productions: 10

$$A_1 \rightarrow A_2 A_3$$

$$A_2 \rightarrow A_3 A_1 \mid b$$

$$A_3 \rightarrow A_1 A_2 \mid a$$

- (b) Construct a reduced grammar equivalent to the grammar: 10

$$S \rightarrow aAa, A \rightarrow Sb \mid bCC \mid DaA., C \rightarrow abb \mid DD, E \rightarrow aC, D \rightarrow aDA$$

SECTION - C

6. (a) Construct a PDA equivalent to the following grammar: 10

$$S \rightarrow aAA, A \rightarrow aS \mid bS \mid a$$

- (b) Does the PCP with $x = (b^3, ab^2)$ and $y = (b^3, bab^3)$ have a solution? 10

7. (a) Explain the Programming Techniques involved in Turing Machines. 10

- (b) Design a Turing Machine to recognize the language $\{a^n b^m c^m \mid n, m \geq 1\}$. 10

SECTION - D

8. Show that CSL are closed under the following operations: 20

- (a) Union
- (b) Substitution
- (c) concatenation
- (d) intersection

9. (a) What is a primitive recursive function? Show that the following function is primitive recursive: 10

$r(x, y)$ = the remainder obtained when x is divided by y .

(b) Show that the function $f(x, y) = x - y$ is partial recursive. 10
