

Roll No.

24266

**B. Tech. 5th Semester
(Computer Science & Engg.)
Examination – December, 2011**

THEORY OF AUTOMATA & COMPUTATION

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.

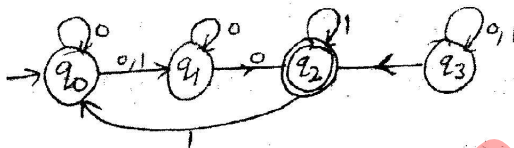
Note : Attempt *five* questions in all. Question No. 1 is *compulsory*. All questions carry equal marks.

1. Discuss the following : 10 × 2 = 20
- (a) Define DFA mathematically with example.
 - (b) Pumping Lemma.
 - (c) Explain Σ^+ .
 - (d) Unrestricted Grammar.
 - (e) ID in Turing M/C with example.
 - (f) PCP Problem.
 - (g) Limitation of PDA.
 - (h) Recursive Function.

(i) Ambiguity.

(j) E-moves.

2. (a) Define NFA mathematically. Explain its significance and function. Convert the given FA into DFA equivalent. Explain the method used taking suitable example. Prove both accept the same string. 15



- (b) Construct a DFA for the following : 5

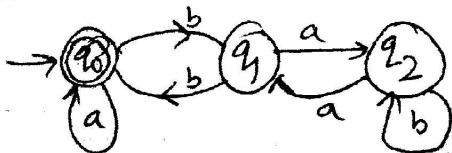
(i) The set of all string that end with 00 over $\Sigma = \{0, 1\}$.

(ii) The set of all string that contain sub-string 010 over $\Sigma = \{0, 1\}$.

3. (a) Explain Mealy M/C. Construct a Mealy M/C equivalent to the Moore M/C given by the following table : 12

	$a = a$ q_{i+1}	$a = b$ q_{i+1}	O/P
q_0	q_1	q_2	0
q_1	q_3	q_2	1
q_2	q_2	q_3	0
q_3	q_3	q_3	1

- (b) Find the regular expression accepted by following automata : 8



4. (a) Show that $L = \{a^n b^n : n \geq 1\}$ is not regular. 8
- (b) Prove that the set of regular languages are closed under complementation. 8
- (c) Construct the regular expression for the following : 4
- The set of all strings over $\{0, 1\}$ with three consecutive 0's.
 - The set of all strings over $\{0, 1\}$ ending with 00 and beginning with 1.
5. (a) Consider the following productions :
 $S \rightarrow 0B \mid 1A ; A \rightarrow 0S \mid 1AA \mid 0 ; B \rightarrow 1S \mid 0BB \mid 1$
 for the string 0001101110, find : (i) the left most derivation, (ii) the right most derivation, (iii) parse trees. 10
- (b) Given grammar $G, S \rightarrow AB, A \rightarrow a, B \rightarrow C \mid b, C \rightarrow D$ and $E \rightarrow a$. Find an equivalent grammar which is reduced. 10
6. (a) What do you mean by PDA ? How it works ? Explain IP for PDA. Also explain language accepted by PDA. 8
- (b) Construct PDA for accepting the language : 12

$$L = \{ww^R : w \in \{a, b\}^+\}$$

7. (a) For $\Sigma = \{0, 1\}$, design a Turing Machine that accepts $L = \{0^n 1^n : n \geq 1\}$. 12
- (b) Discuss Halting problem of Turing Machine. 8
8. (a) Discuss in details Chomsky hierarchies of grammars. Also discuss relationship of languages of grammars. 15
- (b) Determine the type of the grammar G : 5
- (i) $S \rightarrow aA, A \rightarrow aAB, B \rightarrow b, A \rightarrow a$
- (ii) $S \rightarrow aAB, AB \rightarrow C, A \rightarrow b, B \rightarrow AB$
9. Explain the following with example : 20
- (i) Partial recursive function,
- (ii) Primitive recursive function.