10/6/2011

T.E COMP V (Rev)
Theory of Computer Science

137 : 1st half.11-PH(I)

Con. 3499-11. RK-2088

(3 Hours) [Total Marks : 100

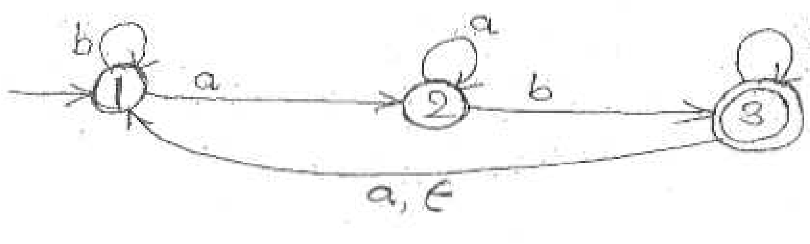
N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) Draw suitable **diagrams** wherever **necessary**.
(4) Assume suitable data, if **necessary**.

1. (a) Differentiate between– 5
   (i) NFA and DFA
   (ii) Moore and Mealy Machines. 5
   (b) Design a Mealy machine for the language $(0 + 1)^*(00 + 11)$ and convert it to a Moore machine. 10

2. (a) Design a DFA to accept the following languages over the alphabet {0,1} 10
   (i) {w I w starts with zero and has odd length or starts with one and has even length }
   (ii) { w I every odd position of w is 1 }
   (b) Find a minimum state finite automata equivalent to the following automata– 10

	0	1
→a	b	a
b	a	c
c	d	b
*d	d	a
e	d	f
f	g	e
g	f	g
h	g	d

3. (a) Give and explain the formal statement of Pumping Lemma for regular languages and use it to prove that the following language is not regular– 10
   $L = \{ a^n b^{2n} \mid n > 0 \}$
   (b) Convert the following NFA with epsilon moves to a minimum state DFA accepting the same language :– 10



4. (a) Design a PDA for the language $L = \{ WCW^R \mid W \varepsilon \{a, b\}^* \}$ 10

(b) Design a PDA for the following grammar and test whether 010^4 is in the language defined by that PDA. 10

$S \rightarrow 0BB$

$B \rightarrow 0S \mid 1S \mid 0$

5. (a) Reduce the following grammars to GNF

(i) $S \rightarrow AB$ 5

$A \rightarrow BSB \mid BB \mid b$

(ii) B aAb | a 5

$S \rightarrow AA \mid 1$

$A \rightarrow SS \mid 1$

(b) Convert the following grammars to CNF 10

$A \rightarrow aBb \mid bBa$

$B \rightarrow aB \mid bB \mid \varepsilon$

6. (a) Design a Turing machine to accept the language $L = \{ a^n b^n \mid n >= 1 \}$ 10

(b) Design a Turing machine that computes a function $f(m, n) = m + n$ for the addition of 2 integers. 10

7. Write short notes on (any **three**) :– 20

(a) Halting problem
(b) Post Correspondence Problem
(c) Chomsky Hierarchy
(d) Intractable Problems
(e) Greibach Theorem.