No. of Printed Pages : 4 **BICS-018**

00106

B.TECH. IN COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

Term-End Examination

June, 2013

BICS-018 : THEORY OF COMPUTATION

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions.*
*All questions carry **equal** marks.*

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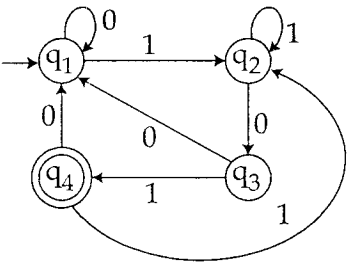
1. (a) Construct a non deterministic finite automation accepting the set of all strings over {a, b} ending in aba. Use NDFA to construct a DFA accepting the same set of string. 5

(b) What is the difference between Mealy and Moore machine ? Construct a Mealy machine which can output EVEN, ODD according to the total number of even and odd 1's encountered. The input symbols are 0 and 1. 5

2. (a) Construct an equivalent DFA for NDFA, 5
$M = (\{q_1, q_2, q_3\}, \{0, 1\}, \delta, q_1, \{q_3\})$
where δ is given by
$\delta(q_1,0) = \{q_2, q_3\}$, $\delta(q_1, 1) = \{q_1\}$
$\delta(q_2,0) = \{q_1, q_2\}$, $\delta(q_2, 1) = \phi$
$\delta(q_3,0) = \{q_2\}$, $\delta(q_3, 1) = \{q_1, q_2\}$

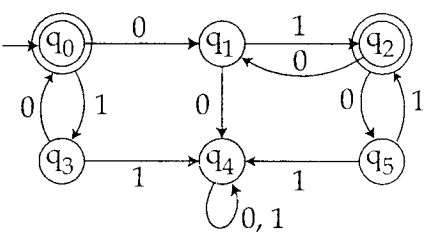
(b) Find the regular expression corresponding to the Finite automation. 5



3. (a) Construct a DFA with reduced states equivalent to the regular expression $10+(0+11)0^*1$. 5

(b) What is pumping Lemma for Regular sets ? Show that $L=\{0^i 1^i \mid i \geq 1\}$ is not Regular. 5

4. (a) What is Myhill-nerode theorem ? Construct minimum state automation equivalent to the DFA. 5



(b) What is context free grammar ? Construct a reduced grammar equivalent to the grammar. 5

$S \rightarrow aAa,\ A \rightarrow Sb/bCC/DaA$

$C \rightarrow abb/.DD,\ E \rightarrow aC,\ D \rightarrow aDA$

5. (a) What are the different normal forms of context free grammar ? Convert a grammar $S \rightarrow AB$, $A \rightarrow BS/b$, $B \rightarrow SA/a$ into Greibach Normal Form (GNF). 5

(b) If a context free grammar is defined by the productions $S \rightarrow a/Sa/bSS/SSb/SbS$. Show that every string in L (G) has more a's than b's. 5

6. (a) What is Push Down Automata (PDA) ? Construct a PDA accepting the language $L = \{wcw^T / w \epsilon \{a, b\}^* \}$. 5

(b) Construct a PDA equivalent to the following context free grammar : $S \rightarrow OBB$, $B \rightarrow OS$ $B \rightarrow IS$, $B \rightarrow O$ and test whether 010^4 is in, N(A) where A is PDA. 5

7. Differentiate between Turing Machine (TM) and Push Down Automata (PDA). Construct a TM to accept the set L of all strings over {0, 1} ending with 010. 4+6

8. (a) What are the differences between recursive and recursive enumerable languages ? Show that union of two recursively enumerable languages is recursively enumerable. 7

(b) What are ram machines ? Explain. 3

9. What is Church's hypothesis ? Explain it. Also describe undecidability and Rice's theorem. **10**

10. Write short notes on ***any two*** of the following : **5x2=10**

(a) NP-complete and NP-hard problems.

(b) Hamiltonian path and Chromatic number problem.

(c) Equivalence among DFA, NFA and NFA with ϵ moves.