No. of Printed Pages : 4

BICS-018

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

Term-End Examination

December, 2012

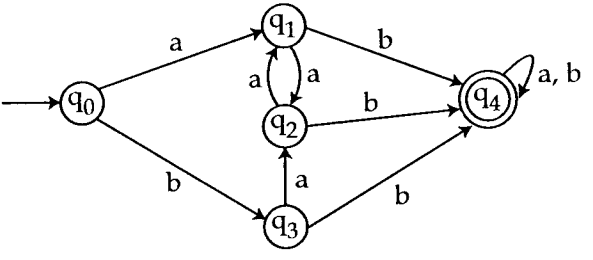
BICS-018 : THEORY OF COMPUTATION

Time : 3 hours *Maximum Marks : 70*

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

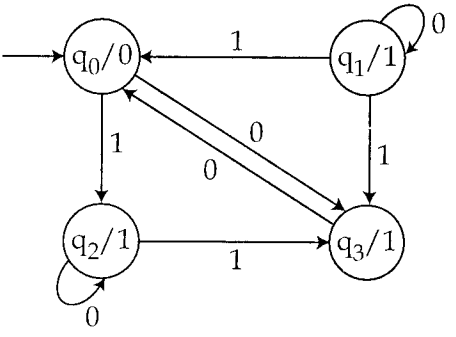
1. (a) Design a finite automation to accept the language L over {a, b} such that $L = \{a^n b^m \mid n, m \geq 0 \text{ and } n+m \text{ is even}\}$. 5

(b) Construct a minimum state automation equivalence to the following diagram. 5

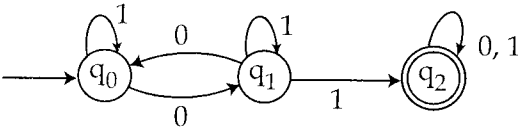


2. (a) Design Moore and Mealy machine to convert each occurrence of substring 100 by 101. 5

(b) Differentiate between Mealy and Moore machine and convert following Moore machine into an equivalent Mealy machine 5



3. (a) Find the regular expression for the following diagram : 5



(b) Construct a DFA for equivalent regular expression (RE) $r = (01 + 2^*)^*1$. 5

4. (a) Explain pumping lemma for regular expression and show that language $L = \{a^n b^n c^n \mid n \geq 1\}$ is not regular. 5

(b) Differentiate between Chomsky and Greibach Normal forms and convert the grammar 5

$S \rightarrow ABb/a$

$A \rightarrow aaA/B$

$B \rightarrow bAb$ into GNF.

5. (a) Explain pumping lemma for context free language (CFL) and prove that the language $L = \{O^K \mid K \text{ is a perfect square}\}$ is not a CFL. 5

(b) Design a context free grammar (CFG) for the language $L(G) = \{a^{2n}\ b^m \mid n \geq 0,\ m \geq 0\}$. 5

6. (a) Differentiate between deterministic and non deterministic push down automata and explain equivalence between push down automata and context free grammars. 5

(b) Design a Push Down Automata (PDA) for the language $L = \{a^n\ b^n \mid n \geq 1\}$. 5

7. (a) For the following PDA M, design the corresponding CFG G. 10

$M = (\{q_0, q_1\}, \{0, 1\}, \{Z_0, K\}, \delta, q_0, Z_0, \phi)$ with transition function δ as follows :

$\delta(q_0, 1, Z_0) \vdash (q_0, K\ Z_0)$, $\delta(q_0, 0, K) \vdash (q_1, K)$

$\delta(q_0, \epsilon, Z_0) \vdash (q_0, \epsilon)$, $\delta(q_1, 0, K) \vdash (q_1, \epsilon)$

$\delta(q_0, 1, K) \vdash (q_0, KK)$, $\delta(q_1, 0, Z_0) \vdash (q_0, Z_0)$

8. What is Turing Machine (TM) ? Design a Turning Machine (TM) which accept the string over {0, 1}, containing even number of 1's. 10

9. Differentiate between NP-Complete and NP-Hard Problems and also discuss about vertex cover problem and Hamiltonian path problem with suitable examples. 10

10. Write short notes on *any two* of the following : **2x5=10**

(a) Hypothesis of Church

(b) Undecidability and Rice's theorem

(c) Recursive and recursively enumerable languages.