

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

18200

Term-End Examination

December, 2013

BICS-018 : THEORY OF COMPUTATION

Time : 3 hours

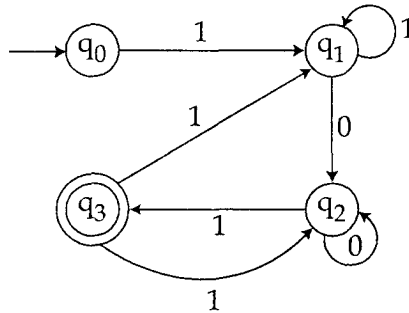
Maximum Marks : 70

Note : Attempt any seven questions.

All questions carry equal marks.

1. (a) What is finite automata (FA) ? Construct a nondeterministic finite automata (NFA) accepting $\{ab, ba\}$ and use it to construct a deterministic automaton accepting the same set. 5
- (b) Differentiate between moore and mealy machine and design a moore and mealy machine for a binary input sequence. If it ends in 101, output is 'A', if it ends in '110' output is 'B', otherwise 'C'. 5
2. (a) Construct a DFA accepting all strings w over $\{0, 1\}$ such that the number of 1's in w is $3 \pmod 4$. 5

- (b) Find the regular expression corresponding to the automaton given below : 5



3. (a) Construct a finite automaton equivalent to the regular expression $(0 + 1(1 + 01)^*00)^*$. 5
- (b) What are the different normal forms of context free grammar ? Construct a grammar in Greibach Normal Form (GNF) equivalent to the grammar $S \rightarrow AA/a$, $A \rightarrow SS/b$. 5
4. (a) What is pumping lemma for Regular sets ? Using pumping lemma show that the following sets are not regular 5
- (i) $a^n b^{2n} | n > 0$
- (ii) $a^n b^m | 0 < n < m$.
- (b) Find a reduced grammar equivalent to the grammar $S \rightarrow aAa$, $A \rightarrow bBB$, $B \rightarrow ab$, $C \rightarrow aB$. 5
5. (a) What is push down automata ? Construct a push down automata (PDA) 'A' accepting the set of all strings over {a, b} with equal number of a's and b's. 5

- (b) Construct a PDA, 'A' equivalent to the following context free grammar $S \rightarrow 0S|1S|0$ and test whether 010^4 accepted by PDA. 5
6. (a) Show that $\{a^n b^n | n \geq 1\} \cup \{a^m b^{2m} | m \geq 1\}$ cannot be accepted by a deterministic PDA. 5
- (b) Differentiate between Turing Machine (TM) and Push Down Automata (PDA). And design a TM to recognize all strings consisting of an even number of 1's. 5
7. Design a Turing Machine (TM) that accepts $\{0^n 1^n | n \geq 1\}$. 10
8. How turing machine is different from Ram ? Explain and also discuss NP-complete and NP-hard problems. 10
9. Explain recursive and recursively enumerable languages with its application and also compare and contrast decidability and undecidability. 10
10. Write short notes on *any two* of the following : $5 \times 2 = 10$
- (a) My hill-nerode theorem and its application
- (b) Church's hypothesis
- (c) Travelling salesman problem and Chromatic number problem
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