

**B.Tech. - VIEP - COMPUTER SCIENCE AND
ENGINEERING (BTCSVI)**

00580

Term-End Examination

June, 2015

BICS-018 : THEORY OF COMPUTATION

Time : 3 hours

Maximum Marks : 70

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

1. (a) Define deterministic finite automation.
Construct a non-deterministic finite automata (NFA) accepting {ab, ba}. 5
- (b) Differentiate between Mealy Machine and Moore Machine. 5
2. (a) Construct a finite automation equivalent to the regular expression $(0 + 1(1 + 01)^* 00)$. 5
- (b) Find a reduced grammar equivalent to the grammar $S \rightarrow aAa, A \rightarrow bBB, B \rightarrow ab, C \rightarrow aB$. 5

3. Write the regular expression for the following language : 10
- (a) The set of all strings of 0's and 1's which ends with 1 and does not contain substring 00.
- (b) The set of all strings of 0's and 1's with an equal number of 0's and 1's such that no prefix has two more 0's than 1's nor more 1's than 0's.
4. Define a deterministic push down automata (DPDA). Give an example of a context free language that is not accepted by any DPDA. 10
5. Define Turing Machine. Design a Turing Machine that computes the integer function f defined as follows : 10
- $f(N) = 3^N$ where N is Integer and $N \geq 0$.
6. Prove that if a language L and complement of L both are recursively enumerable, then L is recursive. 10
7. Design a Mealy Machine that accepts binary string divisible by 3. 10
8. Discuss NP-complete and NP-hard problems with proper examples. 10

9. Non-deterministic PDA is not equivalent to deterministic PDA in terms of language recognition. Explain. 10

10. Write short notes on any *two* of the following : $2 \times 5 = 10$

- (a) Halting Problem
 - (b) Myhill-Nerode Theorem
 - (c) Universal Turing Machine
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