

SVKM'S NMIMS
MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT & ENGINEERING

Program: B. Tech (Computer)

Academic Year: 2018-2019

Year: III Semester : V

Subject: Theoretical Computer Science

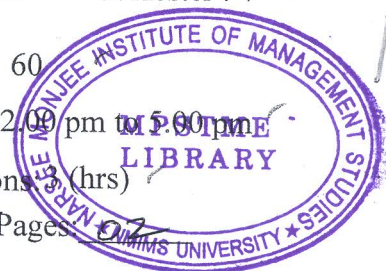
Marks: 60

Date : 22 January 2019

Time: 2:00 pm to 5:00 pm

Durations: 3 (hrs)

No. of Pages: 02



Re-examination (2014-15/ 2015-16/ 2016-17)

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.

- 1) Question No. 1 is compulsory.
- 2) Out of remaining questions, attempt any 4 questions.
- 3) **In all 5 questions to be attempted.**
- 4) All questions carry equal marks.
- 5) **Answer to each new question to be started on a fresh page.**
- 6) **Figures in brackets on the right hand side indicate full marks.**
- 7) **Assume suitable data if necessary.**

- Q 1. a) What are the applications of the following in Compiler Constructions? [2]
- i. Regular Expression
 - ii. Deterministic Finite Automaton
 - iii. Context Free Grammar
 - iv. Pushdown Automaton
- b) Differentiate between Moore and Mealy Machine. [2]
- c) Give the description for the following regular expressions [2]
- i. $r=(b+ba)^*$
 - ii. $r=(1+01+001+0001)(\epsilon,+0+00+000)$
- d) Why Deterministic Finite Automaton (DFA) minimization is required? What are the various approaches of DFA minimization? [2]
- e) Explain the following in relation with Pushdown Automaton (PDA) [4]
- i. Power of PDA over Finite State Machine.
 - ii. Equivalence of Context Free Grammar and PDA.
- Q 2. a) Design Finite Automaton over $\{a, b\}$ to accept all strings "Containing the substring aaa or bbb". [5]
- b) Post Machine is more powerful than Pushdown automation. Justify. [4]
- c) Describe halting Problem. Is it solvable or unsolvable? [3]
- Q 3. a) Explain all the four classes of phase structure grammar suggested by Chomsky. [6]
- b) Consider following grammar for well-formed parentheses: [6]
- $E \rightarrow (E) E$
- $E \rightarrow \epsilon$
- Design pictorial pushdown automata.

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| Q 4. | Construct following machines to find 2's Complements of binary number also simulate the working of both the machines for the inputs: 10011 and 0010100. | |
| a) | Moore machine. | [6] |
| b) | Turing machine. | [6] |
| Q 5. | a) Consider the language L over $\Sigma=\{a,b\}$, where the L is defined as: $L = \{a^n b^n \mid n=0, 1, 2, \dots\}$ Construct Pictorial Post Machine that accepts above language L. Simulate the working of the machine for the inputs: aabb and abb | [6] |
| | b) What is post correspondence problem? Determine whether the following $\{A, B\}$ pair have a solution or not. If yes, give a solution, if not why? $A = \{1, 10111, 10\}$ $B = \{111, 10, 0\}$ | [6] |
| Q 6. | a) Using Pumping lemma, Check whether $0^n 1^n$ is regular or not. | [5] |
| | b) Show that the following Context Free Grammar (CFG) is ambiguous using input string as "id@id#id". $S \rightarrow S @ S \mid S \# S \mid S \$ S \mid S \sim S \mid S ! S \mid id$ Remove the ambiguity and write an equivalent unambiguous CFG. Consider all operators are right recursive except # and highest to lowest precedence is $\{ @, \#, \$, \sim, ! \}$. | [5] |
| | c) Define following terms with one example of each. i. Alphabets ii. Strings iii. Languages iv. Sets | [2] |
| Q 7. | Write Note on: | [12] |
| a) | Thomson's Rule | |
| b) | Pictorial Representation of Post Machine Elements | |
| c) | Recursive and Recursive Enumerable Languages | |
| d) | Properties and limitations of finite state machine | |

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