

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

Programme: B.Tech (Computer)

Year: III

Semester: V



Academic Year: 2015-16

Batch: 2013-14

Subject: Theoretical Computer Science

Date: 08 June 2016

Marks: 100

Time: 2.00 pm – 5.00 pm

Durations: 3 (hrs)

Re-Examination

Instruction: 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.

NB:

- 1) **Question No. 1 is compulsory.**
- 2) Out of remaining questions, attempt any **Four** questions.
- 3) In all **Five** 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.

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|------|---|-------|
| Q. 1 | a) Obtain NFA with ϵ moves for given regular expression
$(ab+ba)^*(a+a)(ab+ba)^*$ | (5M) |
| | b) State and Explain properties and limitations of FSM | (5M) |
| | c) Find context free language for given context free grammar
$S \rightarrow aSb \mid ab$ | (5M) |
| | d) Write a short note on Universal Turing Machine | (5M) |
| Q. 2 | a) State and prove pumping lemma for regular language | (10M) |
| | b) Design Mealy machine to replace occurrence of 110 by 111 | (10M) |
| Q. 3 | a) Show that $L = \{a^i b^j c^k \mid k > i+j\}$ is not regular. | (10M) |
| | b) Explain rules for simplification of context free grammar. | (10M) |
| Q. 4 | a) Design Turing Machine for accepting string with equal number of a's and b's over $\{a,b\}^*$. | (10M) |
| | b) Construct Post machine for accepting Language $L = \{a^n b^n c^n \mid n > 0\}$. | (10M) |
| Q. 5 | a) Construct Push Down Automata for accepting even length palindrome over $\{0,1\}^*$ | (10M) |
| | b) Let G be the grammar with Productions $\{S \rightarrow aB \mid bA, A \rightarrow a \mid aS \mid bAA, B \rightarrow b \mid bS \mid aBB\}$.
Find i) Leftmost derivation, ii) Rightmost derivation & iii) Parse Tree for the string "aaabbabbba". | (10M) |
| Q. 6 | a) Design Deterministic Finite Automata for accepting all the decimal numbers divisible by 4. | (10M) |
| | b) What is ambiguous grammar? Explain steps to remove ambiguity in grammar. | (10M) |

Q. 7

Write a short note on **any four** of the following

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|----|---|------|
| a) | Properties of Regular Languages. | (5M) |
| b) | Elements of Post Machine. | (5M) |
| c) | Halting problem | (5M) |
| d) | Properties of Recursively Enumerable Languages. | (5M) |
| e) | Undecidability | (5M) |