

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

Programme: B. Tech (COMP)
Batch: 2013-2014

Year: III Semester: V

Academic Year: 2014-2015

Subject: **Theoretical Computer Science**

Date: 27/11/2014

Marks: 100
Time: 2.00 pm to 5.00 pm
Duration: 3 (hrs)



Re-Examination

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.

NB: - 1) Question No **ONE** is compulsory

2) Out of remaining attempt **FOUR** questions,

3) All Questions carry equal marks.

4) Figures in brackets on right hand side indicate full marks

Q1. Attempt All

- A) Construct Post machine for accepting Language $L = \{a^n b^n c^n \mid n > 0\}$. [8]
- B) Prove with the help of example that the Post correspondence problem is undecidable. [7]
- C) En-list and explain the limitations of Finite Automata. [5]

- Q2.**
- A) Show that "Context Free Language is super set of Regular Language". [8]
 - B) Design a Mealy Machine for converting every sequence of "1001" to "1000" from the input string over an alphabet $\Sigma = \{0,1\}^*$. [8]
 - C) Convert the following regular expression into equivalent English statements (Any Two) [4]
 - i) $(10 + 111)0^*1$.
 - ii) $(a+b)^*abb(a+b)^*$.
 - iii) $(a+b)^*ba$.

- Q3.**
- A) Design Turing Machine for accepting string with equal number of a's and b's over $\{a,b\}^*$. [8]
 - B) Construct Push Down Automata for accepting even length palindrome over $\{0,1\}^*$. [8]
 - C) Show that the CFL's are closed under union, concatenation and Kleen operation. [4]

- Q4.**
- A) 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 [10]
 - i) Leftmost derivation,
 - ii) Rightmost derivation & iii) Parse Tree for the string "aaababbba".
 - B) Find PDA equivalent to the grammar rules $\{S \rightarrow abAB, A \rightarrow bAB \mid \epsilon, B \rightarrow baA \mid A \mid \epsilon\}$. [10]

- Q5.**
- A) Design Deterministic Finite Automata for accepting all the decimal numbers divisible by 4. [10]
 - B) Show that $L = \{a^n b^n c^n \mid n > 0\}$ is Non-CFL. [10]

- Q6. A) Give Non-deterministic finite automata with ϵ -moves for $((10+011)^*+11)^*+0)101$. [10]
- B) Give context free grammar for generating all the strings for the language [10]
 $L = \{\#w\#w^R\$ \mid w \in (0+1)^*, w^R \text{ is the reverse of } w \text{ and } \{\#, \$\} \text{ are terminal symbols}\}.$

Q7. Write Short Note (Attempt Any 4) [20]

- A) Applications of Automata in Compiler Construction. [5]
- B) Properties of Recursively Enumerable Languages. [5]
- C) Universal Turing Machine. [5]
- D) Pumping Lemma for Context Free Language. [5]
- E) Properties of Regular Languages. [5]
- F) Elements of Post Machine. [5]

$x \longleftarrow x$