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

Programme: B. Tech (Computer) Year: III Semester: V

Academic Year: 2019-20

Subject: Theoretical Computer Science

Date: 07 November 2019

Marks: 60
Time: 10.00 am - 1.00 pm
Durations: 3 (hrs)
No. of Pages: 2

Re-Examination (2015-16)

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. **01** is compulsory.
2) Out of remaining questions, attempt any **04** questions.
3) **In all 05 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) Explain applications and limitations of finite Automata (04)
b) Explain Chomsky hierarchy of grammar (04)
c) Compare DFA and PDA (04)

Q.2 a) Consider following CFG: (06)
$S \rightarrow iCtS|iCtSeS|a$
$C \rightarrow b$
Derive the string "ibtibtaea" using leftmost derivation and rightmost derivation. Draw syntax tree for the same.
b) Design Moore and Mealy machine to convert each occurrence of 110 to 111 (06)

Q.3 a) Using pumping lemma prove that language $L=\{a^n b^n | n>=0\}$ is not regular (06)

Q.3 b) What is post correspondence problem? Determine whether the following list has a PCP solution or not. (06)

	A	B
i	w_i	x_i
1	001	01
2	0011	111
3	11	111
4	101	010

Q.4 Design Turing machine to compute 2's complement of given binary number (12)

Q.5 a) Design DFA to accept the language containing all strings over $\sum=\{a,b\}$ that starts and ends with different symbols (06)

b) Explain following terms relation with Turing machine. (06)
(i) Solvability
(ii) Semi-Solvability
(iii) Unsolvability

Q.6 a) Design Push Down Automata to accept language $L=\{a^n b^n | n>0\}$ (06)

b) Convert the following grammar to CNF. (06)
$S \rightarrow AACD$
$A \rightarrow aAb \mid \varepsilon$
$C \rightarrow aC \mid a$
$D \rightarrow aDa \mid bDb \mid \varepsilon$

Q.7 a) Construct a NFA with 'ε' transition for following RE (06)
(00+11)* (10)*

b) Write a note on halting problem (06)