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

Programme:B. Tech (COMP) 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
Durations: 3 (hrs)

Final-Examination

Instructions:- candidates should read carefully the instruction 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

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Q1. **A)** Construct Turing machine for Accepting Language $L = \{0^n\ 1^n\ 2^n\ |n \geq 0\}$ [8]

B) Prove that "if L is recursive, so is $\bar{L}$". [7]

C) En-list and explain the various types of finite Automata. [5]

Q2. **A)** State and explain the pumping lemma for Context Free Language. [8]

B) Design a Mealy Machine for converting every sequence of "100" to "101" from the Input string over a alphabet $\sum = \{0,1\}^*$. [8]

C) Write Regular Expression for the following languages (Any Two) [4]

i) Set of all strings ending with "bba" or "abb" over $\sum = \{a, b\}$.
ii) Set of all strings containing at most 3 a's over $\sum = \{a, b\}$.

Q3. **A)** Design Turing Machine to compute $Log_2 n$, where n is any unary number. [8]

B) Construct Push Down Automata for accepting odd length palindrome over {0, 1}*. [8]

C) Explain closure properties of context free languages. [4]

Q4. **A)** Design a Context Free Grammar for language L, such that L contains all binary strings equivalent, to number divisible by 4. Give left-most derivation, right-most derivation derivation tree for generating binary representation of twelve. [10]

B) Design Push Down Automata to accept $a^n(bda)^n$, for $n > 0$. [10]

Q5. **A)** Design Deterministic Finite Automata for accepting all the decimal numbers divisible by 3. [10]

B) Design a Mealy Machine for the language (0+1)* (00 + 11) and convert it into Moore Machine. [10]

Q6. **A)** Give minimized Deterministic Finite Automata for "a.a.(ba)*+b* .a.b.a*". [10]

B) i) Convert the following into CNF [5]

$$A \rightarrow aBb|bBa$$
$$B \rightarrow aB|bB|\epsilon$$

ii) Convert the grammar to GNF [5]

$$S \rightarrow AB$$
$$A \rightarrow BSB|BB|b$$

Q7. **Write short Note (Attempt any 4)** **[20]**

A) Turing Machine Types [5]
B) Un-decidable problem [5]
C) Post Correspondence [5]
D) Church's hypothesis [5]
E) Elements of Post M/C [5]
