# C.U. SHAH UNIVERSITY Winter Examination-2018 

## Subject Name: Theory of Computation

Subject Code: 4TE06TOC1
Semester: 6

Date: 30/10/2018

## Branch: B.Tech (CE)

Time : 02:30 To 05:30 Marks : 70

Instructions:
(1) Use of Programmable calculator \& any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

## Q-1 Attempt the following questions:

a) Define: Finite Automata
b) Define: Regular Expression
c) List out special features of Turing machines.
d) Define: Context Sensitive Grammar
e) Differentiate the concept of determinism ad non-determinism
f) Define: parse tree?
g) What is difference between push down stack and push down store ?
h) What is unit production?
i) The number of eight-bit strings beginning with either 111 or 101 is:
(i) 64 (ii) 128 (iii) 265 (iv) None of the above
j) Define: Push down Automata
k) What is kleene closure?
l) 3-SAT and 2-SAT problems are
(i) NP-Complete and P (ii) Undecidable and NP -complete (iii) Both NP-

Complete (iv) Both in P
m) Find a regular expression over the subset of $\{0,1\}^{*}$, the language of all the strings containing no more than one occurrence of the string 0 .
n) Define: Turing Machine

Attempt any four questions from $\mathbf{Q}-2$ to $\mathbf{Q - 8}$

## Q-2 Attempt all questions

a) Define One-to-one and onto Functions. Also explain Compositions and Inverse of functions.
b) Define NFA $-\Lambda$. Explain how to convert NFA $-\Lambda$ into NFA and FA with suitable example.

## Q-3 Attempt all questions

a) Define Context Free Grammar(CFG).

Find CFG for following language:
$\mathrm{L}=\left\{0^{\mathrm{i}} 1^{\mathrm{j}} 0^{\mathrm{k}} / \mathrm{j}>\mathrm{i}+\mathrm{k}\right\}$
b) Define the Strong Principle of Mathematical Induction. Prove the following using mathematical Induction.
$7+13+19+\ldots \ldots \ldots+(6 n+1)=n(3 n+4)$
Q-4

## Attempt all questions

a) (i) Draw FA for $(a+b) *$ baaa.
(ii)Write a Regular Expression for the String of 0's and 1's in which number of 0 's and 1's are even.
b) Let L be the language corresponding to the regular expression $(011+1)^{*}(01)^{*}$. Find the CFG generating L.

Q-5

## Attempt all questions

a) Check whether the given grammar is in CNF

S-> bA|aB
A-> bAA|aS|a
B-> aBB|bS|b
If it is not in CNF, Find the equivalent CNF.
b) For following NFA find minimum FA accepting same language.


Q-6 Attempt all questions
a) Draw PDA accepting strings of Brackets like following.

S -> SS | $\{\mathrm{S}\}|[\mathrm{S}]| \Lambda$
b) What is pumping lemma? Use the pumping lemma to show that the following language is not regular:
$L=\left\{x y \mid x, y\right.$ is $\{0,1\}^{*}$ and $y$ is either $x$ or $\left.x^{r}\right\}$
Q-7
Attempt all questions
a) State and prove Arden's Theorem.
b) Explain ambiguity in the CFG with the example of the "Dangling Else". Also write down the unambiguous grammar for the "Dangling Else".

## Q-8 Attempt all questions

a) Explain Polynomial Time Reductions and NP- Completeness.
b) Draw TM for accepting Palindrome Strings in $\{a, b\}^{*}$.

