B.Tech. SEM -V (Computer) 2014 Course (CBCS) : WINTER - 2018

SUBJECT-FORMAL LANGUAGES AND AUTOMATA THEORY

Day: Thursday **W-2018-2389** Time: 02.30 PM TO 05.30 PM

Date: 22/11/2018 Max Marks: 60

N.B.:

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Assume suitable data if necessary.

Q.1 **a)** Define Basic machine and compare basic machine with FA **(05)**

b) Design DFA that reads string made up of letters in the word 'CHARIOT' and recognize these strings that contain word 'RAT' as substring. **(05)**

OR

Q.1 **a)** Give formal definition of DFA and NFA. Comment on Is DFA is faster than NFA? **(05)**

b) Design DFA that accept all strings over alphabet $\sum(a,b)$ containing number of a's are multiple of 3. **(05)**

Q.2 **a)** Give the Mealy machine for following processes "for input from(0+1)* if inputs ends in 101 output 'x', if input ends in 110 output 'y', otherwise 'z'. **(06)**

b) Show that L= $\{a^p | p \text{ is a prime}\}$ is not regular by pumping lemma. **(04)**

OR

Q.2 **a)** Find regular expression corresponding to each of the following subset of $\{0,1\}^*$ **(06)**
i)The language of all strings containing exactly two 0's.
ii) The language of all strings containing at least two 0's.
iii) The language of all strings that do not end with 01.

b) Compare Moore and Mealy machine with example **(04)**

Q.3 **a)** Explain Chomsky Hierarchy **(04)**

b) Convert the following grammer to GNF **(06)**
i) S $\longrightarrow$ ABA|AB|BA|AA|A|B
ii) A $\longrightarrow$ aA|a
iii)B $\longrightarrow$ bB|b

OR

Q.3 **a)** Explain closure and decision properties of CFL. **(04)**

b) For right linear grammar given below obtain an equivalent left linear grammar **(06)**
S $\longrightarrow$ 10A|01, A $\longrightarrow$ 00A|1

P.T.O.

Q.4 **a)** Construct DPDA accepting L= {w $\in${a,b}*| the number of a's in a w equals the number of b's in w} by final state. **(06)**

b) Give formal definition of post machine and give example. **(04)**

OR

Q.4 **a)** Design PDA for the following CFG **(06)**
G={S $\rightarrow$aAA, A$\rightarrow$bS, A $\rightarrow$aS, S$\rightarrow$a}

b) Compare Deterministic PDA with Non deterministic PDA **(04)**

Q.5 **a)** Design Turing machine M to recognize the language { a^n, b^n, c^n| $n \geq 1$} **(06)**

b) Explain multi stack Turing machine **(04)**

OR

Q.5 **a)** State and prove halting problem of turing machine **(06)**

b) Give formal definition of Turing machine and its limitations. **(04)**

Q.6 **a)** Show that for two recursive languages L_1 & L_2 each of the following recursive **(05)**
i) $L_1 \cup L_2$ ii) $L_1 \cap L_2$

b) Explain stack evaluation as application of PDA **(05)**

OR

Q.6 **a)** Prove the theorem " if L_1 and L_2 are recursively enumerable languages over $\sum$ then $L_1 \cup L_2$ and $L_1 \cap L_2$ are also recursively enumerable **(06)**

b) Explain lexical analyzer as application of FA. **(04)**

* * * *