2017

COMPUTER SCIENCE & TECHNOLOGY

PAPER : CSIT-3.1

THEORY OF COMPUTATION

FULL MARKS: 80 Time : 3 hours

{ The figures in the margin indicate full marks for the question.}

1.Answer the following questions: 1x10=10

(i) A Moore machine accepts a string w of length n.The length of the output string is

(a) n+1 (b) n-1

(c) n^2 (d) n

(ii) The language accepted by finite automata is

(a)Type 0 (b) Type 1

(c)Type 2 (c) Type 3

(iii) The output of Moore Machine depends on

(a) The present state only

(b) The present state and the input symbol

(c) The input symbol only

(d) None of these

(iv) The regular set denoted by the Regular Expression (a+b) + (a+b) is

(a) {a,b} (b) {a,b,ab,ba}

(c) {aa,ab,ba,bb} (d) {a,b,bb,aa}

(v) The Proof of Pumping Lemma is an example of

(a) iteration (b) recursion

(c) Pigeon hole principle (d) all of the above

(vi) A regular expression representing all possible strings of even length over {a,b} is

(a) (a+b)(a+b) (b) (a+b)(a+b)*

(c) (a+b)*(a+b)* (d) (aa+ab+ba+bb)*

(vii) A regular expression (0+1)(0+1).....(0+1) k times can be represented by a Finite Automata with

(a) exactly k states (b) exactly k+1 states

(c) less than k states (d) cannot be determined

(viii) The CFL $L=\{a^n b^n/1\}$ can be generated by the following CFG

(a) $S' \rightarrow \varepsilon/ab/aSb$ (b) $S' \rightarrow ab/aSb$

(c) $S' \rightarrow \varepsilon/aSb$ (d) all of the above

(ix) The Regular expression corresponding to CFG $S' \rightarrow aS/bS/a/b$ is

(a) a+b (b) (a+b)*

(c)(a+b)*(a+b) (d) none of the above

(x) A CFL is accepted by a

(a) Pushdown automata (b) Finite automata

(c) Turing machine (d) none of the above

2.Answer the following questios: 3X10=30

(a)If G is the grammar S' → SbS/a,Show that G is ambigious.

(b) Design a DFA for the set of strings over {a,b,c} having bca as substring.

(c) Prove that -

$$(1+00^*1)+(1+00^*1)(0+10^*1)(0+10^*1)=0^*1(0+10^*1)^*$$

(d) Find the following regular expression:

(i) the set of all strings containing at most 2a's over {a,b}

(ii) the set of strings over {a,b} containing exactly 2a's and 2b's

(e) Eliminate Null production from the following Grammar G:

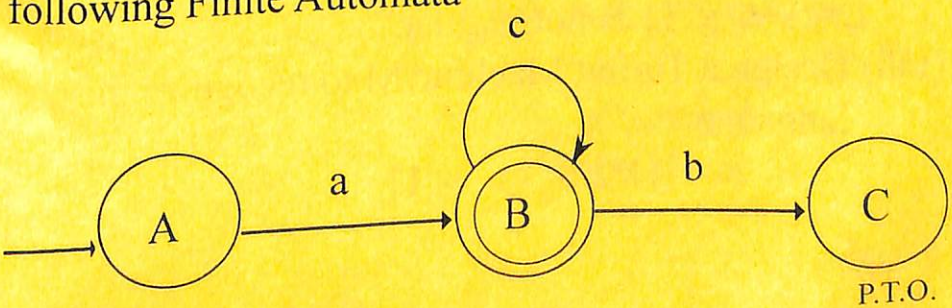
$$S' \rightarrow AAA / B,\ A' \rightarrow 0A / B,\ B' \rightarrow \varepsilon$$

(f) Define ID of a Turing Machine.

(g) Describe the model of a PDA.

(h) Construct a Finite Automata for the Regular Expression (ab+c*)*b.

(i) Find a Regular Expression corresponding to the following Finite Automata



(j) Define Mealy and Moore machine.

3.Answer the following questios:(Any five) 5X8=40

(i) Define Chomosky Classification of Languages.

(ii)Write the definitions of CNF and GNF. Find a grammar in CNF equivalent to S' $\rightarrow$ abSb/ab.

(iii) Construct a PDA A equivalent to the following context-free grammar: S' $\rightarrow$ 0BB, B' $\rightarrow$ 0S/1S/0.Test whether $\mathbf{010^4}$ is in N(A).

(iv) If L is regular then L^T is also regular.

(v) Find (a)Leftmost derivation and
(b)Rightmost derivation
for the string **aaabbabbba** of Grammar G
S' $\rightarrow$ aB /bA, A' $\rightarrow$ a/aS/bAA, B' $\rightarrow$ b/bS/aBB

(vi) Write the differences of DFA and NFA

M=($\{q_1,q_2,q_3\}$,{0,1}, δ ,q_1,$\{q_3\}$) is NDFA where$\delta$is given by

$\delta(q_1,0)=\{q_2,q_3\}$ $\quad$ $\delta(q_1,1)=\{q_1\}$

$\delta(q_2,0)=\{q_1,q_2\}$ $\quad$ $\delta(q_2,1)=\varphi$

$\delta(q_3,0)=\{q_2\}$ $\quad$ $\delta(q_3,0)=\{q_1,q_2\}$

Construct an equivalent DFA.

(vii) State the pumping lemma.Show that the Set $L=\{a^{i2}/i^n \geq 1\}$ is not regular.

(viii) Design a Turing Machine M to recognize the language

$$\{1^n2^n3^n / n \geq 1\}$$