2018

FORMAL LANGUAGE AND AUTOMATA THEORY

MCA :3.5

Full Marks: 75

Time: 3 Hours

The figures in the margin indicates full marks for the questions :

(All Questions Are Compulsory)

1.Answer the following: 1X10=10

(i) The output of the Mealy 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

(ii) The language accepted by PDA is
- (a) Type 0
- (b) Type 1
- (c)Type 2
- (c) Type 3

(iii) A Moorey Machine accepts a string w of length k.The length of the output string is
- (a) k+1
- (b) k-1
- (c) k
- (d) k^2

(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 the language { ε ,a,b} is
(a) a+b (b) ab
(c) ε ab (d) ε +a+b

(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 $L=\{a^nb^n/n \geq 0\}$ can be generated by the following CFG
(a) S→ε/ab/aSb
(b) S→ab/aSb
(c) S→ε/aSb
(d) all of the above

(ix) The Regular expression corresponding to CFG S→aS/bS/a/b is
(a) a+b
(b) (a+b)*
(c)(a+b)*(a+b)
(d) none of the above

(x) A Type 0 language is accepted by a
(a) Pushdown automata (b) Finite automata
(c) Turing machine (d) none of the above

2.Answer the following: 3X10=30

(a)Show that the grammar S→a/abSb/aAb, A→bS/aAAb is ambigious.

(b) Design a DFA for the set of strings over {a,b,} odd no's of a's and odd no of b's.

(c) Prove the following Identity- ϕ+R= R+ ϕ

(d) Find the following regular expression:

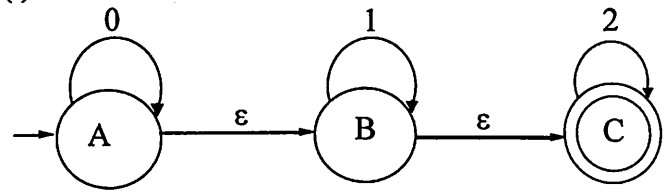
(i) the set of all strings containing at least 2a's over {a,b}

(ii) the set of strings over {0,1} containing alternate 0,s and 1's.

(e)Construct a regular grammer G generating the regular set represented by

P=a*b(a+b) *.

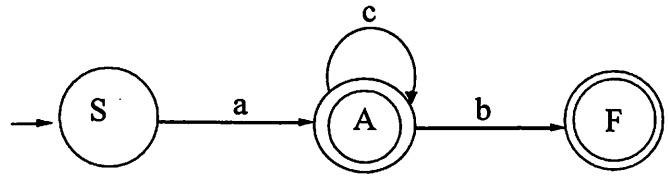
(f) Construct a finite automata without null moves-



(g) Describe the model of a PDA.

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

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



(j) Define Mealy and Moore machine.

3.Answer the following (Any five): 5X7=35

(a) Show that $L=\{0^i1^j/ i\geq 1\}$ is not regular.

(b) What is CNF? Find a grammar in CNF equivalent to S→ aAbB, A→aA/a, B→bB/b.

(c) Construct a PDA accepting {anbman / m,n?1} by null store.Construct the corresponding contex-free grammar accepting the same set.

(d) If L is regular then LT is also regular.

(e) Find (i)Leftmost derivation and
(ii)Rightmost derivation
for the string aaabbabbba of Grammar G
S→aB /bA, A→a/aS/bAA, B→b/bS/aBB

(f) Construct an equivalent DFA with reduced states equivalent to the Regular Expression 10 + (0 + 11) 0*1.

(g) Define Chomosky Classification of Languages.

(h) construct a minimum state automaton equivalent to the finite automata from the given transition table:

State/Σ	0	1
q_0	q_1	q_2
q_1	q_4	q_3
q_2*	q_4	q_3
q_3*	q_5	q_6
q_4	q_7	q_6
q_5	q_3	q_6
q_6	q_6	q_6
q_7	q_4	q_6

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