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RM-7065

B. E. III (Sem. VI) (CO. / I.T.) Examination

May / June – 2010

Automata & Formal Languages

Time : 3 Hours] [Total Marks : 100

Instruction :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. 3 (Sem. 6) (CO)

Name of the Subject :

☛ Automata & Formal Languages

☛ Subject Code No. : 7 0 6 5 ☛ Section No. (1, 2,.....) : 1&2

Seat No. :

Student's Signature

(2) Figures to the extreme **right** indicate maximum marks.

(3) Assume suitable data, if **necessary**.

(4) Support your answer with neat and clean diagram wherever **necessary**.

SECTION - I

Q. 1 (a) **Do as directed:** [10]

(1) Give the minimum complement Regular Expression for b * (abb*) * (^ + a) considering union RE is (a + b)* [2]

(2) Check the validity of the following equality with proper reason [2]
(0 + 1) * 01 (0 + 1) * + 0*1* = (0 + 1) *

(3) Give the recursive definition: Finite Subset (F) of the Natural Numbers (N). [2]

(4) Define star height of the regular expression. Calculate star height for [3]
(a (a + a*aa) + aaa)*. Consider $\sum$ = {a, b}

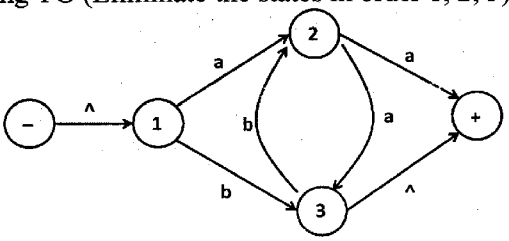
(5) Define : Dead End State [1]

Q. 1 (b) **Do as directed:** [10]

(1) Using Minimal Finite Automata procedure convert the following DFA into minimum number of states DFA (minimized FA) where $\sum$ = {0,1}. [5]

Q	0	1
- 1	2	3
2	4	5
3	6	7
4	4	5
5	6	7
+ 6	4	5
7	6	7

(2) Using bypass and state elimination technique find regular expression for the following TG (Eliminate the states in order 1, 2, 3) [5]



Q. 2 Attempt any TWO from the following [10]

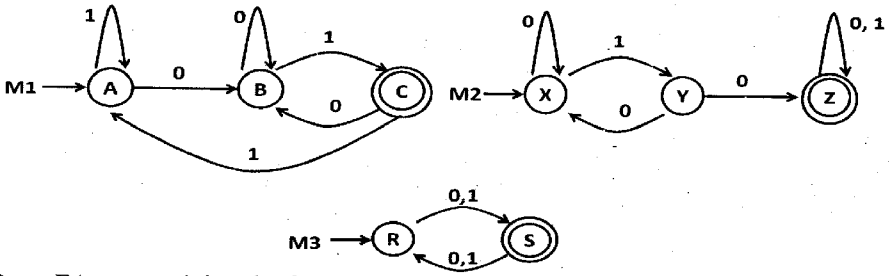
(a)

(1) Draw FA for the regular expression : (1 + 110)* 0 where $\sum = \{0,1\}$ [5]

(2) For the NFA - ^ given below, calculate $\delta^*(q_0, 0101)$ where $\sum = \{0, 1\}$. Also comment on the validity of the string 0101. [5]

Q	δ(q, ^)	δ(q, 0)	δ(q, 1)
- q_0	{p,t}	Ø	Ø
p	Ø	p	R
r	Ø	s	Ø
s	w	Ø	S
t	Ø	u	T
u	Ø	v	Ø
v	w	v	Ø
+w	q_0	Ø	Ø

(3) Let M1, M2 AND M3 be the FAs pictured in figure, recognizing languages L1, L2 and L3, respectively. [5]



Draw FAs recognizing the following languages

(i) L1 ∩ L2

(ii) L3 – L2

Q. 2 (b) Define Pumping Lemma. Prove that the language $L = \{0^i 1^j \mid i > j\}$ is not regular using pumping lemma. [6]

Q. 3

(a) Consider the following NFA-^.

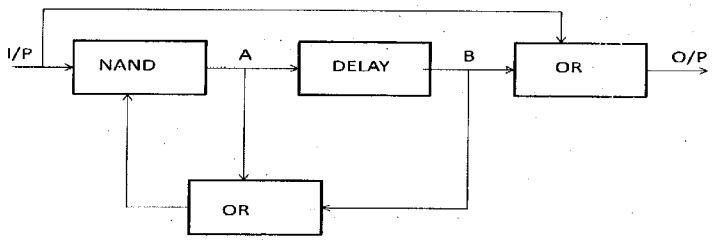
Q	δ(q, ^)	δ(q, 0)	δ(q, 1)
-A	{B}	{A}	Ø
B	{D}	{C}	Ø
C	Ø	Ø	{B}
+D	Ø	{D}	Ø

(i) Convert this NFA-^ into its equivalent NFA. [3]

(ii) Take this NFA as an input and convert it into equivalent DFA [5]

OR

(a) Draw a Melay Machine equivalent to the following Sequential circuit [8]



(b) Draw an FA that recognize the language of all strings of 0's and 1's of length at least 1, that if they were interpreted as binary representation of integers, would represent evenly divisible by 5. (leading 0's are not permissible) [6]

SECTION – II

Q:4	A	Find CFG for the following languages [Any Two] : (i) $L = \{a^i b^j a^k \mid j > i+k\}$ (ii) $L = \{a^i b^j c^k \mid i = j \text{ or } j = k\}$ (iii) The language define over $\sum=\{0,1\}^*$ containing all strings with a triple b in them.	6
	B	For the following CFG's, describe the language it accepts : (i) S → SS | XaXaX | ^ X → bX | ^ (ii) S → aS | bS | a | b | ^ (iii) S → aM | bS M → aF | bS F → aF | bF | ^	6
	C	Enlist applications of Context Free Grammars.	2
Q:5	A	Attempt any TWO of the following:	10
	i)	Consider the CFG given below and convert it into a form with no ^ and no unit productions. S → AB A → a B → C | b C → D D → E E → a	
	ii)	Design a TM for the language $L = \{ 0^n 1^n 0^n \mid n>1\}$	
	iii)	Consider the following grammar G and find the Regular Expression and Finite Automata that defines the same language : S → bS | aA | b A → bA | aB B → bB | aS | a	

	B	Construct PDA for the language $L = \{a^m b^n c^p d^q \mid m+n = p+q\}$	8
		OR	
	B	Construct PDA for the following CFG : $S \rightarrow XY$ $X \rightarrow aX \mid bX \mid a$ $Y \rightarrow Ya \mid Yb \mid a$	8
Q:6	A	Prove that "Intersection of two CFL may or may not be context free".	5
	B	Build TM for subprogram DELETE.	8
		OR	
	B	Build a TM over $\sum=\{0,1\}^*$ that accepts the language PALINDROME.	8
	C	Fill ups the following blanks : 1. A CFG G is said to be _____ if there exists a string w in L(G), for which more than one parse trees can be generated. 2. A _____ is a production of the form $A \rightarrow B$, where A and B both are non-terminals. 3. For the CFG $S \rightarrow aS \mid bS \mid a$ equivalent regular expression is _____. 4. A PDA is an extension of FA, with _____ as storage media. 5. Recursively enumerable languages are accepted by _____.	5