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BTC-401, UCS-401 Roll No. .....

B. TECH (CSE) & B. TECH (CSE) + MBA

FOURTH SEMESTER END TERM EXAMINATION : APRIL – 2013

THEORY OF AUTOMATA & COMPUTATION

Time : 3 Hrs. *Maximum* Marks : 70

Note: Attempt questions from all sections as directed.

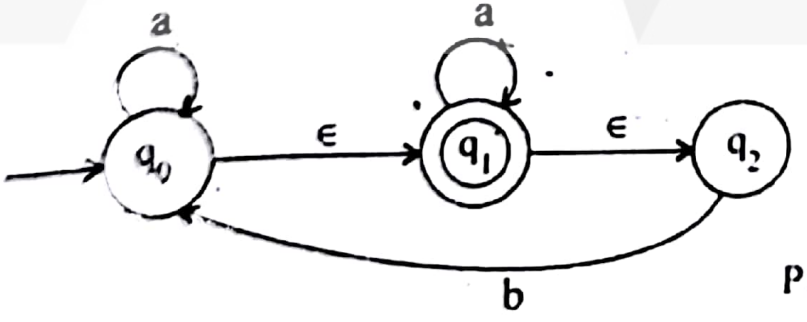
SECTION – A (30 Marks)

Attempt any **5** *questions.*

Each question carries **6** *marks.*

1. (a) Define Automata and it's applications. Differentiate Finite Automata and Cellular Automata. (2)

(b) Can NFA simulate a DFA ? Construct a DFA from the following C-NFA and also compute C-Closure of each state. (1+2+1)

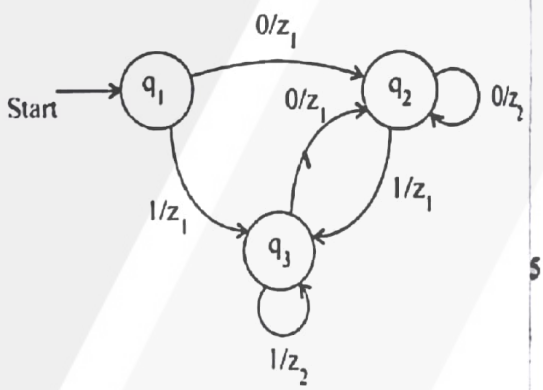


P.T.O.

2. (a) Differentiate 2 DFA and DFA. Write down Crossing Sequences for the string 101001 an DFA given below

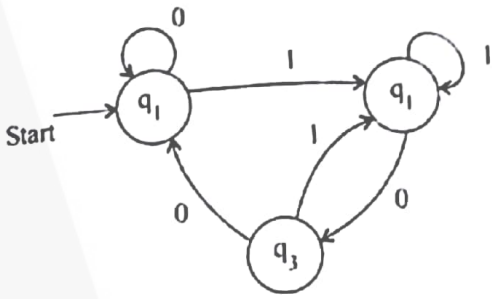
	0	1
→ q_1	(q_1, R)	(q_2, R)
* q_2	(q_2, R)	(q_3, L)
q_3	(q_1, R)	(q_3, L)

(b) Can Moore Machine simulate a Mealy Mach or vice versa ? Give justification in support of answer and also construct Moore Machine f the given Mealy Machine. (1



3. (a) What is Linear Bounded Automata (LBA Explain it's importance in context of Con Sensitive Languages.

(b) State and Prove Arden's Theorem. Comp Regular Expression corresponding to the follow (



(a) Prove or Disprove the following :

(i) $\epsilon + 0(0+1)^* + (0+1)^* 00(0+1)^* = [(1^*0)^* 01^*]^*$

(ii) $L = \{a^n b^n c^n : n \geq 1\}$ is not regular (2+2)

(b) What is ambiguous Grammar ? Check the ambiguity of the following grammar

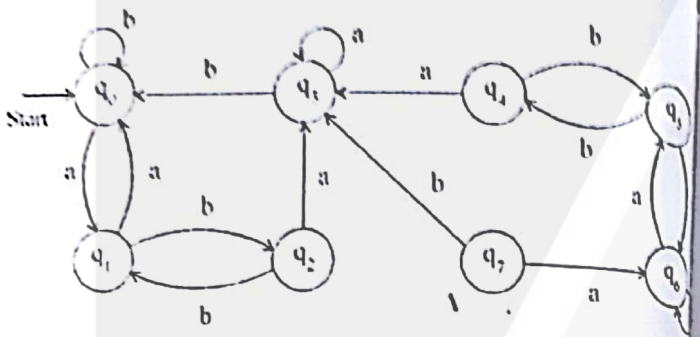
$S \longrightarrow aS / aSbS / \epsilon$ (1+1)

5. (a) Differentiate Context Free Grammars and Regular Grammars. Construct Left Linear and Right Linear Grammar for the following :

$a(ba)^*$ (2)

(b) State the My Hill Nerode Theorem and it's use. Also apply the My Hill Nerode Theorem on the following DFA. (4)

P.T.O.



6. (a) Explain the term Computability in contex Automata and also differentiate the following

Partial functions, Total functions and Primi recursive functions (1

(b) Design a Push down Automata for the follow Language

$$L = \{a^n b^n : n > 0\}$$

SECTION – B (20 Mar

Attempt any two *questions.*
Each question carries 10 *marks.*

7. (a) State Decision Algorithms for Context f language. Explain the CYK algorithm and ch the membership and also construct matrix of input string baaba for the grammar

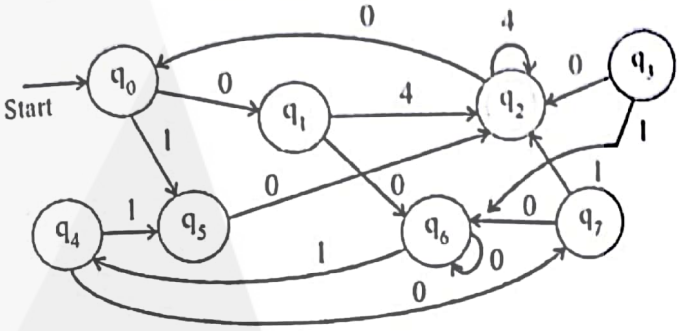
S ⟶ AB / BC

A ⟶ BA / a

B ⟶ CC / b

C ⟶ AB / a (1+2+3)

(b) Construct Minimum State Automata from the following Automata. (4)



8. (a) State the Pumping Lemma for Context Free Languages. Also Prove or disprove that

$L = \{a^n b^m c^p : n < m < p\}$ is not CFL (2+2)

(b) What are CNF and GNF of context free grammar ? Explain with examples. Convert the following Grammar into GNF form

$G = (\{S_1, S_2, S_3\}, \{a, b\}, P, S_1\}$

P consist of the following :

$S_1 \longrightarrow S_2 S_3$

$S_2 \longrightarrow S_3 S_1 / b$

$S_3 \longrightarrow S_1 S_2 / a$ (2+4)

P.T.O.

9. (a) (i) Construct a PDA for the following:

$L = \{a^m b^n c^m d^n : m, n \geq 1\}$

(ii) Construct CFG from the following PDA

$A = (\{q_0, q_1\}, \{a, b\}, \{a, z_0\}, \hat{\sigma}, q_0, z_0)$

$\hat{\sigma}$ is given as

$\hat{\sigma}(q_0, a, z_0) = \{(q_0, a\, z_0)\}$

$\hat{\sigma}(q_0, a, a) = \{(q_0, aa)\}$

$\hat{\sigma}(q_0, b, a) = \{(q_1, a)\}$

$\hat{\sigma}(q_1, b, a) = \{(q_1, a)\}$

$\hat{\sigma}(q_1, a, a) = \{(q_1, C)\}$

$\hat{\sigma}(q_1, C, z_0) = \{(q_1, C)\}$

(b) State Chomsky Hierarchy and also differen the Recursive Languages and Recursive Enumer Languages.

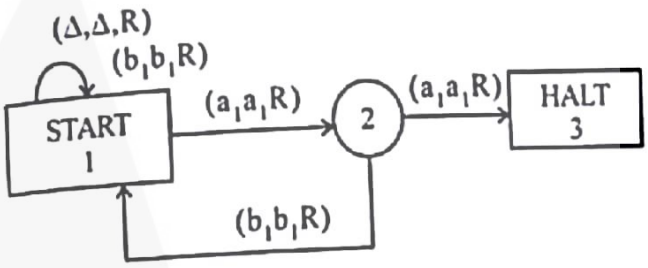
SECTION – C

(20 Mar

(Compulsory)

10. (a) What do you mean by Undecidability? Exp the Halting Problem of Turing Machine and explain whether it is Solvable or not. Write d the Language accepted by the following Tu Machine

(2+2



(b) (i) What do you mean by Post Correspondence Problem (PCP)? Whether PCP is decidable or not Explain the application of PCP.

(2+1+1)

(ii) Does the PCP with the following lists

$X = (b, bab^3, ba)$ and $Y = (b^3, ba, a)$

Has a solution? If so then write all the possible solutions. (2)

(c) (i) Design the Turing Machine which accepts the Language which contains the strings of PALINDROME over alphabet $\Sigma = \{a, b\}$. (4)

(ii) Design the Turing Machine for the Langunge (4)

$L = \{a^n b^{2n} : n \geq 1\}$

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