6E6023

Roll No. _____ Total No of Pages: 4

6E6023

B. Tech. VI-Sem. (Main/Back) Exam., April/May-2016

Computer Science

6CS3A Theory of Computation

Common for IT

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks (Main & Back): 26

Instructions to Candidates:-

*Attempt any **five questions,** selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT-I

Q.1 (a) M = ({q1, q2, q3}, {0, 1}, δ, q1, {q3}) is nondeterministic finite automaton, where δ is given by [8]

$\delta(q1, 0) = \{q2, q3\}$, $\delta(q1, 1) = \{q1\}$

$\delta(q2, 0) = \{q1, q2\}$, $\delta(q2, 1) = \phi$

$\delta(q3, 0) = \{q2\}$ $\delta(q3, 1) = \{q1, q2\}$

Construct an equivalent DFA.

(b) Explain the model of a discrete automaton, also describe its characteristics. [8]

OR

Q.4 Design a Truing machine over {1, b} which can compute a concatenation function over $\Sigma = \{1\}$.

If a pair of words (w1, w2) is the input, the output has to be w1 w2. [16]

UNIT-V

Q.5 Explain the model of Linear bounded automaton, also explain the relationship between LBA and context sensitive languages. [16]

OR

Q.5 Write short note on (any 2):- [8×2=16]

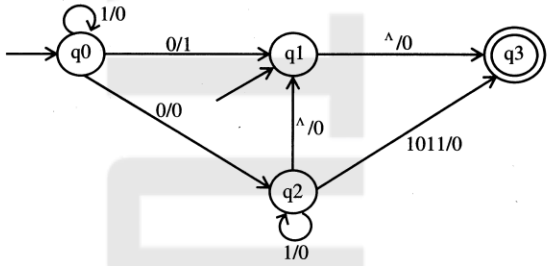
(a) Chomsky Hierarchy of languages

(b) Properties of LBA

(c) Context sensitive languages

OR

Q.1 (a) Describe the block diagram of a finite automaton. Consider the transition system given below.



Determine the initial states, the final state and the acceptability of 101011 and 111010. [8]

(b) Prove that for any transition function δ and for any two input string x and y.

$\delta(q, xy) = \delta(\delta(q, x), y)$ [8]

UNIT-II

Q.2 (a) If G = ({S}, {0, 1}, {S → 0 SI, S → ∧}, S), find L (G) with explanation. [8]

(b) Find the language generated by the grammar S → AB, A → A 1/0, B → 2B/3. Can the above language be generated by a grammar of higher type? [8]

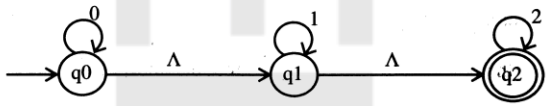
OR

Q.2 (a) Prove that :

$(1 + 00 * 1) + (1 + 00 * 1)(0 + 10 * 1) * (0 + 10 * 1) = 0 * 1 (0 + 10 * 1)^*$ [8]

(b) Consider a finite automaton, with ∧ - moves, given in a figure

Obtain an equivalent automaton without ∧ - moves. [8]



UNIT-III

Q.3 Define pushdown automaton model and its role, also illustrate the move relation in details. [16]

OR

Q.3 (a) Consider the following productions: [8]

$S \rightarrow a\,B \mid b\,A$

$A \rightarrow a\,S \mid b\,A\,A \mid a$

$B \rightarrow b\,S \mid a\,B\,B \mid b$

for the string a a a b b a b b b a, find

(i) the leftmost derivation,

(ii) the rightmost derivation, and

(iii) the parse tree

(b) Reduce the following grammars in Chomsky normal form: [8]

(i) $S \rightarrow \mid A \mid 0B,\ A \rightarrow \mid AA \mid 0S \mid 0,\ B \rightarrow 0BB \mid IS \mid \mid$

(ii) G = ({S}, {a, b, c}, {S → a | b | cSS}, S)

(iii) S → a b S b | a | a A b, A → b S | a A A b

UNIT-IV

Q.4 (a) Explain Turing machine model and its working functions. [8]

(b) Consider the TM description below. Draw the computation sequence of the input string 00. [8]

Present State	Tape Symbol		
	b	0	1
→ q1	1 Lq2	0 Rq1	
q2	b Rq3	0 Lq2	1 Lq2
q3		b Rq4	b Rq5
q4	0 Rq5	0 Rq4	1 Rq4
(q5)	0 Lq2		