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TCS-405/TIT-405

B. Tech. (CS/IT) (Fourth Semester) End Semester EXAMINATION, 2017

THEORY OF COMPUTATION

Time : Three Hours] [Maximum Marks : 100

Note : (i) This question paper contains *five* questions with alternative choice.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mention against it.

(iv) Total marks assigned to each question are twenty.

1. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Explain the theories of computability, complexity and automata.

(b) Explain Chowmsky hierarchy with examples.

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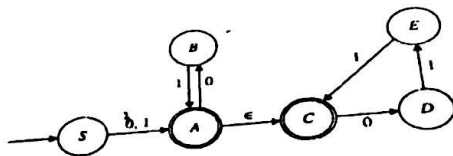
- (c) (i) Find equivalent Mealy machine of the following Moore machine :

State	a	b	Output
q0	q1	q2	0
q1	q0	q2	1
q2	q2	q1	0

- (ii) Find equivalent Moore machine of the following Mealy machine :

State	a	Output	b	Output
q0	q1	0	q2	0
q1	q2	1	q0	0
q2	q0	0	q1	1

2. Attempt any *two* questions of choice from (a), (b) and (c).
(2×10=20 Marks)
- (a) Find the equivalent NFA of this ϵ -NFA.



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- (b) Consider the following NFA :

$$M = (\{q_1, q_2, q_3, q_4, q_5\}, \{0, 1\}, \{q_1\}, \{q_5\}, \delta)$$

State	0	1
q1	q1	q5
q2	-	q3
q3	q4	q3
q4	q3, q5	-
q5	-	q1

Find its equivalent DFA.

- (c) Design a finite automaton to accept the language L over {a, b} such that $L = \{w/n_a(w) < n_b(w)\}$ where $w \in (a,b)^*$.

3. Attempt any *two* questions of choice from (a), (b) and (c).
(2×10=20 Marks)

- (a) What is context free grammar ? Design a grammar that accepts odd palindrome strings over {0, 1}.

- (b) Design the context free grammar for following languages :

- (i) string having equal no. of 0's and 1's
(ii) string of 0 and 1 containing 010 as substring

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- (c) State the pumping lemma for context free languages.
4. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)
- (a) Convert the following context free grammar in Greibach Normal form :
- $$S \rightarrow XX/0$$
- $$X \rightarrow SS/1$$
- (b) Design the Deterministic PDA for $L = \{0^i 1^j 2^k 3^l / i = 1, j = k\}$.
- (c) Design DPDA for $L = \{0^i 1^j / j = 2i\}$. Derive its equivalent context free grammar.
5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)
- (a) What do you understand by Turing Machine ? List its variants. Also explain Universal Turing Machine.
- (b) Describe on halting problem of Turing machine and its undecidability.
- (c) Design a Turing Machine that recognizes language $L = \{0^i 1^j 2^k / i = j = k\}$ over $\Sigma = \{0, 1, 2\}$.