Theory of Computer Science
(1020)

P. Pages : 3

Time : Three Hours

Max. Marks : 100
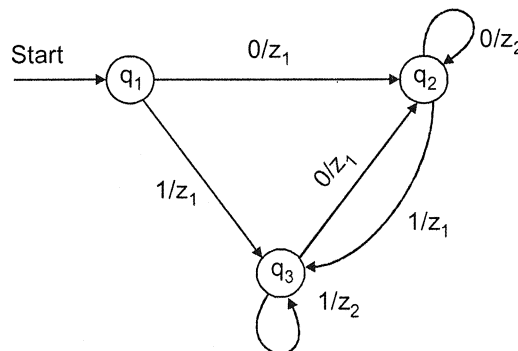
Instructions to Candidates :
1.   Do not write anything on question paper except Seat No.
2.   Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3.   Students should note, no supplement will be provided.
4.   Attempt **any two** questions from each unit.
5.   Assume suitable data if necessary.
6.   Figures to the right indicate full marks.

UNIT - I

1.   a)   Construct a minimum state automaton equivalent to a DFA whose transition table is defined by following table: **10**

State	Input	
	a	b
→ q_0	q_1	q_0
q_1	q_0	q_2
q_2	q_3	q_1
((q_3))	q_3	q_0
q_4	q_3	q_5
q_5	q_6	q_4
q_6	q_5	q_6
q_7	q_6	q_3

b)   Consider a Mealy machine represented by following figure. Construct a Moore machine equivalent to this Mealy machine.   **10**

c)   Write a short note on :   **10**
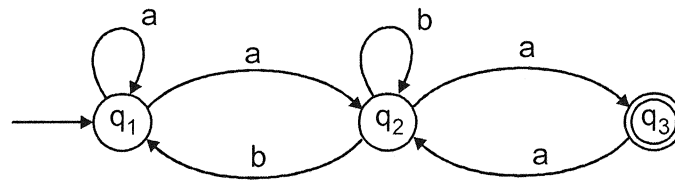
   i)   DFA and NFA

   ii) Moore and Mealy machine.

UNIT - II

2. a)   Consider the transition system given in following figure. Prove that the strings recognized are : $(a + a(b + aa)^* b)^* a(b + aa)^* a.$ **10**

b)   Show that $L = \left\{0^i\, 1^i \mid i \geq 1\right\}$ is not regular.   **10**

c)   Explain Decision algorithms for regular sets.   **10**

UNIT - III

3. a)   Find a grammar generating $L = \left\{a^n b^n c^i \mid n \geq 1, i \geq 0\right\}.$ **10**

b)   Construct a grammar in greibach normal form equivalent to the grammar. $S \rightarrow AA \mid a, \quad A \rightarrow SS \mid b$ **10**

c)   Explain chomsky hierarchy.   **10**

UNIT - IV

4. a)   Construct a PDA accepting all palindrome over {a, b}.   **10**

b)   Construct a deterministic PDA accepting $L = \{w \in \{a,b\}^* \mid$ the number of a's in w equals the number of b's in w } by final state.   **10**

c)   Explain PMT system with example.   **10**

UNIT - V

5. a) Design a Turing Machine M to recognize the language : $\{1^n 2^n 3^n \mid n \geq 1\}$.   10

    b) Design a Turing Machine over {1, b} which can compute a concatenation function over $\Sigma = \{1\}$. If a pair of words (w_1, w_2) is the input, the output has to be $w_1 w_2$.   10

    c) Write a short note on :   10

        i)   Halting problem of Turing machine.

        ii) Multistack Turing machine.

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