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BICS-010

B.Tech. – VIEP – COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

00347

Term-End Examination

December, 2017

BICS-010 : FORMAL LANGUAGES AND AUTOMATA

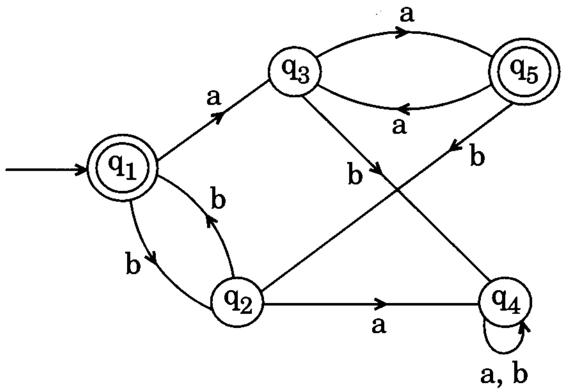
Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks.*

1. (a) Design a DFA to accept the language $L = \{w \mid w \text{ has } 3k + 1 \text{ b's for some } k \in N\}$ over alphabets $\Sigma = \{a, b\}$ (where N is a natural number). *5*

   (b) Prove $L = \{w \in (0, 1)^* \mid w \text{ contains the same number of 0's and 1's}\}$ is non-regular using pumping lemma. *5*

2. Construct a minimum state automaton equivalent to the following diagram : *10*



3. Prove that the following language is ***not*** a CFL by pumping lemma : *10*

$$L = \{a^n a^{n+1} c^{n+2} \mid n \geq 0\}$$

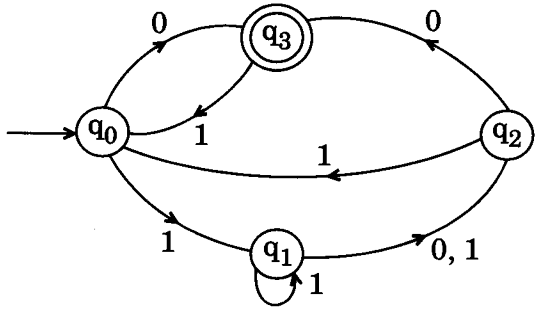
4. Write the definition of Moore Machine and convert the following Mealy Machine into equivalent Moore Machine : *10*

Present State	Next State			
	a = 0		a = 1	
	Next state	Output	Next state	Output
→ a	d	0	b	1
b	a	1	d	0
c	c	1	c	0
d	b	0	a	1

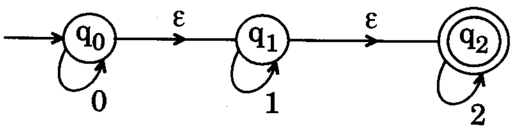
5. Define Turing Machine. Design a Turing Machine that accepts the following language : *10*

$$L = \{a^{n+1} b^n \mid n > 0\}$$

6. (a) For the given state diagram of a NFA, find the equivalent DFA. *5*



(b) Construct a DFA from the given NFA with ε moves. *5*



7. Convert the following context-free grammar to Greibach Normal Form (GNF) : *10*

$S \rightarrow AB \mid BC$

$A \rightarrow AB \mid a$

$B \rightarrow AA \mid CB \mid b$

$C \rightarrow a \mid b$

8. Let f_1 and f_2 be two natural functions which are computed by TM M_1 and M_2 respectively. Construct a TM that computes max (f_1, f_2). *10*

9. Define DPDA. Design a PDA for recognizing

$L = \{a^m \; b^n \; c^o \; d^p \mid m, n, o, p \geq 1$ and $m + n = o + p\}$. *10*

10. Write short notes on any ***two*** of the following : *2×5=10*

(a) Variants of Turing Machine

(b) Post Correspondence Problem

(c) Chomsky Hierarchy

(d) Recursive and Recursively Enumerable Languages