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BICS-010

00140

B.Tech. COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

Term-End Examination

June, 2013

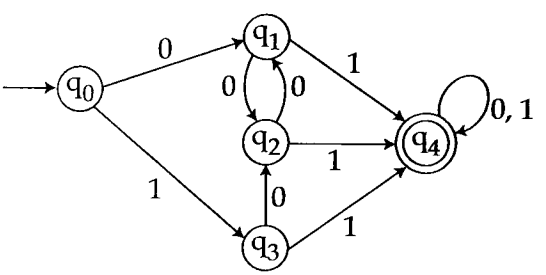
BICS-010 : FORMAL LANGUAGES AND AUTOMATA

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions.*

1. (a) Design a finite automata (FA) to accept the Language L over {a, b} such that $L = \{a^n b^n \mid n,m \geq o$ and $n+m$ is even$\}$ **5**

(b) Construct a minimum state automaton equivalence to the following diagram : **5**



2. (a) Using pumping Lemma prove that the language L = $\{o^s \mid$ s is a perfect square$\}$ is not regular. **5**

(b) Design a CFG for the language L over {0,1} to generate all possible strings of even length. 5

3 (a) Prove that the language $L = \{0^n 1^n 2^n | n \geq 1\}$ is not a Context free Language (CFL). 5

(b) Convert the CFG $G = (\{S,A,B\}, \{a, b\}, P, S)$ with its production set P as $S \rightarrow aA|bB$ $A \rightarrow bAA|a$, $B \rightarrow BBa|b$ to Chomsky Normal form (CNF). 5

4. What is Push down automata (PDA) ? Design a PDA M to accept the Language $L = \{a^n b^{2n} | n \geq 1\}$. 4+6

5. For the following PDA M, design the corresponding CFG - 10

The transition functions for the PDA is as follows -

$\delta\ (q_o, a, z_o) \vdash (q_o, az_o)$, $\delta\ (q_1, a, a) \vdash (q_2, \epsilon)$

$\delta\ (q_o, a, a) \vdash (q_o, aa)$, $\delta\ (q_2, a, a) \vdash (q_2, \epsilon)$

$\delta\ (q_o, c, a) \vdash (q_1, a,)$ $\delta\ (q_2, \epsilon, z_o) \vdash (q_2, \epsilon)$

6. (a) Differentiate between a recursive and recursively enumerable language and also give the example of a language that is neither recursive nor recursively enumerable. 5

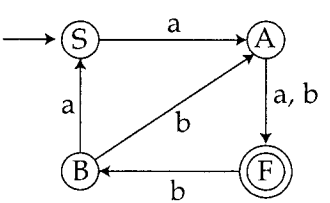
(b) What is CYK algorithm ? Explain it with suitable application. 5

7. (a) Prove that the language $L = \{0^n, 1^n 2^n | n \geq 1\}$ is not a CFL and also explain Pumping Lemma for context free grammars. 5

(b) Design a DFA for the Regular expression $(0+1)(01)^*(011)^*$. 5

8. What is Turing machine ? Design a Turing machine (TM) which will compute 2's complement of a binary number. 4+6

9. (a) Find the regular expression (RE) corresponding to the following finite automata - 5



(b) Differentiate between Moore and Mealy machine, with the help of suitable example. 5

10. Write short notes on **any two** : 10

(a) Church - Turing thesis

(b) Universal Turing machine

(c) Undecidability and Reducibility