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BICS-010

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

00363

Term-End Examination

December, 2016

BICS-010 : FORMAL LANGUAGES AND AUTOMATA

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Explain the terms : regular sets, regular expressions and closure properties. *5*

   (b) Let R = {(1, 2), (2, 2), (2, 3)} be a relation on the set 1, 2, 3. Find R*. *5*

2. (a) Construct a finite automaton to accept the regular expression

   $$(0 + 1)^* (00 + 11) (0 + 11)^*.$$ *5*

   (b) Construct FA equivalence to the following regular expression : *5*

   $$r = 01[((10)^* + 111)^* + 0]^* 1$$

3. (a) Construct a DFA for the regular expression $r = (a + b)^* abb$ and optimize the states. 5

(b) Construct NFA for the following regular expression : 5

$$0 + 10^* + 01^*0$$

4. (a) What is Chomsky normal form ? Convert the following context-free grammar to Chomsky normal form : 5

$S \rightarrow AaB \mid aaB$

$A \rightarrow \varepsilon$

$B \rightarrow bbA \mid \varepsilon$

(b) Convert the following grammar into CNF : 5

$S \rightarrow aAD$

$A \rightarrow aB \mid bAB$

$B \rightarrow b$

$D \rightarrow d$

5. (a) Define push down automata and explain its model with the help of a neat diagram. 5

(b) Prove that if L is $L(M_2)$ for some PDA M_2, then L is $N(M_1)$ for some PDA M_1. 5

6. (a) State and explain CYK algorithm using some examples. 5

(b) List the problems that are decidable for deterministic CFLs. 5

7. (a) Explain the terms turing machine and Recursively enumerable language. *5*

(b) Explain the procedure involved in the design of a turing machine. *5*

8. (a) Write a short note on universal turing machine. *5*

(b) Explain in detail : Church's thesis. *5*

9. Explain Chomsky hierarchy of languages with the help of a neat diagram. *10*

10. (a) Show that $L = \{a^n b^n c^n : n >= 1\}$ is a context sensitive language. *5*

(b) Discuss briefly about undecidability of the Post correspondence problem. *5*