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BICS-010

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

00496

Term-End Examination

June, 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) What are the concepts of Automata Theory ? Explain with the help of some examples. 5

(b) Define formal definition of finite automata. State the diagrams of the two-state finite automaton and five-state finite automaton. 5

2. (a) Define regular expressions and find the regular expression for the following : 5

$L = \{\omega \mid$ every odd position of ω is a 1 defined over $\Sigma = \{0, 1\}\}$

(b) Prove (or) disprove the following for the regular expressions r and s : 5

(i) $(rs + r)^* r = r(sr + r)^*$

(ii) $(r^*s^*)^* = (r + s)^*$

3. (a) Show that $L = \{\omega\omega \mid \omega \in \{a, b\}^*\}$ is not regular. *5*

(b) Prove $L = \{\omega\omega^R \mid \omega \in (a \mid b)\}$ is not regular using pumping lemma. *5*

4. (a) Define ambiguous grammar and give an example to show that the following grammar is ambiguous. *5*

$$S \rightarrow aSbS \mid bSaS \mid \varepsilon$$

(b) When is a grammar said to be in reduced form ? Explain. *5*

5. (a) Convert the following context-free grammar to pushdown automata : *5*

$$S \rightarrow aA \mid bB$$

$$A \rightarrow aB \mid a$$

$$B \rightarrow b$$

(b) State and explain Myhill-Nerode theorem with the help of example grammar. *5*

6. Show the equivalence of CFL and PDA. *10*

7. (a) Design a Turing Machine that recognizes the set $\{0^{2n}\ 1^n \geq n = 0\}$. *5*

(b) Design a Turing Machine which will recognize the strings containing equal number of 0's and 1's. *5*

8. (a) What is recursively enumerable language ? Explain with the help of an example. 5

(b) Show that if L and L^R are recursively enumerable, then L is recursive. 5

9. (a) What are NP Complete and NP Hard problems ? Explain with the help of examples. 5

(b) Find whether the post correspondence problem P = {{10, 101}, {011, 11}, {101, 011}} has a match. Give the solution. 5

10. (a) What is halting problem ? Explain. 5

(b) Explain Turing reducibility machine. 5