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

Term-End Examination

ꟽ0953   **June, 2018**

BICS-018 : THEORY OF COMPUTATION

Time : 3 hours   *Maximum Marks : 70*

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

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1. (a) Design a DFA over {a, b} in which every 'a' should be followed by bb.   5

    (b) Construct a finite automata equivalent to the regular expression   5

    $$(0 + 1)^* \ 00 \ (0 + 1)^*$$

2. (a) Let $G = \{V_N, \Sigma, \ P, S)$ be given by the productions

    $S \to AB \,|\, CA, B \to BC \,|\, AB, A \to a, C \to aB \,|\, b$

    Construct a reduced grammar for the given grammar.   5

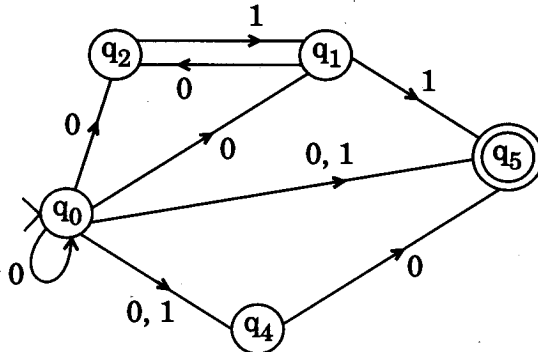   (b) State and explain closure properties of regular sets.   5

3. (a) Define Context Free Grammar. Show that the following CFG is ambiguous : 5

$E \rightarrow E + E$

$E \rightarrow E * E$

$E \rightarrow id$

(b) Prove that $(r + s)*$ is not equal to $r* + s*$ and $r(s + t)$ is equal to $(rs + rt)$. 5

4. (a) Define NDFA with the help of example. 3

(b) Convert the following NDFA to DFA. 7

5. Define Deterministic Push Down Automata (DPDA). Design a DPDA for the language

$L = \{w \, c \, w^R \mid w \text{ belongs to } (a, b)*\}$ 10

6. Differentiate between Turing Machine (TM) and Push Down Automata (PDA). Construct a TM to accepts the set L of all strings over $\{0, 1\}$ ending with 010. 10

7. Define Chomsky Normal Form (CNF) and Greibach Normal Form (GNF). Convert the following grammar to CNF : $5+5=10$

$S \rightarrow AaB \mid aaB$

$A \rightarrow \varepsilon$

$B \rightarrow bbA \mid \varepsilon$

8. Prove that for two recursive languages L_1 and L_2, their union and intersection is recursive. **10**

9. Prove the equivalence of PDA and CFL. **10**

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

(a) Hamiltonian Path

(b) Chromatic Number Problems

(c) Universal Turing Machine