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BICS-010

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

Term-End Examination

June, 2018

00013

BICS-010 : FORMAL LANGUAGES AND AUTOMATA

Time : 3 hours *Maximum Marks : 70*

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

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1. (a) Define ambiguity in context free grammar. Check whether the grammar G with the production rules

$X \rightarrow X + X \mid X^{**}X \mid a$ is ambiguous or not. *5*

(b) Construct a phase structure grammar that generates the set $\{0^n 1^n \mid n = 0, 1, 2, \ldots\}$. *5*

2. (a) What are the properties of a regular set ? Explain any two properties of the regular set with examples. *5*

(b) Define regular set for the following regular expressions :

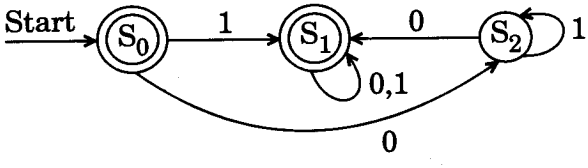
$(0 + 10^*), (0^*110^*)$ *5*

3. (a) Define Finite State Machine (FSM). Design a FSM that adds two integers using their binary expression and explain the solution. 7

(b) Give a formal definition of automata. 3

4. (a) How do you check through a pumping lemma whether a grammar is context free or not ? Discuss. 6

(b) Find the language recognized by the given deterministic finite automata. 4



5. (a) Define Pushdown Automata. How is it different from deterministic finite automata ? 4

(b) Prove that the concatenation of two regular sets is regular. 6

6. Write an algorithm to find Pushdown Automata (PDA) corresponding to a context free grammar. 10

7. (a) Define a Turing Machine. What is the common way to define it ? How are Turing Machines used to recognize a regular set ? 5

(b) Describe the meaning of the following regular sets (in words) : 5

(i) $(1 \cup 00)^*$

(ii) $(00^*1)^*$

8. (a) State and explain the Myhill-Nerode theorem with the help of an example. 6

(b) Let us consider the grammar

$G = (\{S, A\}, \{a, b\}, S, \{S \rightarrow aAB,$
$aA \rightarrow aaAb, A \rightarrow \varepsilon\})$

where,

S, A = non terminal symbols

a, b = terminal symbols

ε is an empty string

S = Start symbol

Production P : $S \rightarrow aAB$, $aA \rightarrow aaAb$, $A \rightarrow \varepsilon$.

Show that the string aaabbb can be derived from the grammar. 4