Code: 9A05407

R09

B.Tech II Year II Semester (R09) Supplementary Examinations May/June 2016

FORMAL LANGUAGES & AUTOMATA THEORY

(Computer Science & Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 Draw a DFA that recognizes the language of all strings of 0's and 1's for length ≥ 1 that, if they were interpreted as binary representations of integers, would represent integers evenly divisible by 3. Leading 0's are permissible.

2 Prove the theorem 'Let L be a set accepted by non-deterministic finite automata, then there exists a DFA that accepts L'.

3 Using the pumping lemma show that each of these languages is not regular:
(a) $L = \{a^n b a^{2n} | n>=0\}$.
(b) $L = \{a^i b^i c^c | k>i+j\}$.

4 (a) Construct CFG without $\in$production form $S \rightarrow a|Ab|aBa$, $A \rightarrow b|\in$, $B \rightarrow b|A$.
(b) Explain the relationship between derivation and derivation tree with an example.

5 (a) Show that the Context Free Languages are not closed under intersection.
(b) State whether S → aSbS / bSaS / Є is ambiguous or not. Support your answer by giving any two examples.

6 (a) Show that if L is accepted by a PDA in which no symbols are ever removed from the stack, then L is regular.
(b) Design a PDA for recognizing $L = \{ a^i b^j / j <= i \text{ and } i, j > 0 \}$. Show the moves of the PDA for the string 'aabb'.

7 Write short notes on:
(a) Multitape TMs.
(b) Universal TM.
(c) Counter machine.

8 (a) Define P and NP problems with examples.
(b) What is PCP? Explain why PCP with two lists x = (01, 1, 1) and y = (0101, 10, 11) has no solution.

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