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Question Paper Code : 13215

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

Fifth Semester

080230020 — FORMAL LANGUAGES AND AUTOMATA THEORY

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is finite automata?

2. Give a DFA which accepts (a/b)*abb.

3. State the rules that define the regular expressions.

4. Give few algebraic laws that hold for arbitrary regular expressions r, s and t.

5. What does the statement that the regular languages are closed under complement mean?

6. Give formal statement of Pumping Lemma for a regular Language 'L'.

7. Define context-free grammar.

8. What is Parsing?

9. State the properties of CFL.

10. Differentiate PDA from that of Finite State Machines.

PART B — (5 × 16 = 80 marks)

11. (a) Discuss McNaughton-Yamada-Thompson algorithm to convert a regular expression to an NFA.

Or

(b) With neat step by step explanation construct an NFA for r = (a/b)*abb.

12. (a) Recall that a context-free grammar is said to be a regular grammar if each production has one of the following three forms:

A -> aB

A -> a

A -> ε

Where A and B are any non-terminals, and a is any terminal. Prove that a language L is a regular language if and only if there exists a regular grammar G such that L = L(G).

Or

(b) Construct the minimum state DFA's for the following regular expressions:

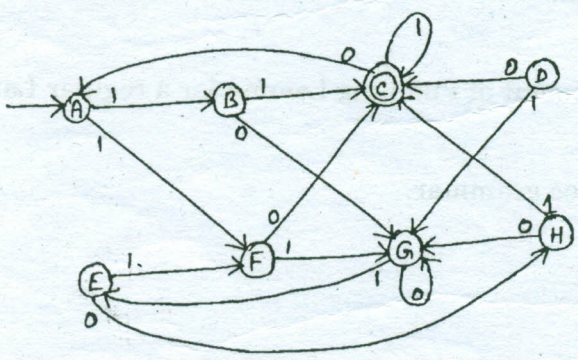
(i) (a | b)*a(a | b)

(ii) (a | b)*a(a | b)(a | b)

13. (a) Prove L1 = $\{0^n 1^n \mid n > 0\}$ is not a regular language.

Or

(b) Give an algorithm for minimization of Finite Automata. Apply your algorithm to the automaton given below.



14. (a) (i) Construct a syntax-directed translation scheme to translate postfix arithmetic expressions into equivalent prefix arithmetic expressions. (8)

(ii) Show that all binary strings generated by the following grammar have values divisible by 3. (8)

$$num \rightarrow 11 \mid 1001 \mid num\ 0 \mid num\ num$$

Or

(b) What is parsing? What are the different parsing methods? Discuss in detail the 'predictive parsing'.

15. (a) (i) What are the different Normal Forms available for Context Free Grammars. State where shall these Normal Forms be useful. (4)

(ii) Show that the language $L = \{a^n\ b^n\ c^n : n \geq 0\}$ over the alphabet $\Sigma = \{a,b,c\}$ is not context-free. (12)

Or

(b) Discuss the closure properties and decision properties of CFL.