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Question Paper Code : 51131

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fifth Semester

Computer Science and Engineering

080230020 — FORMAL LANGUAGES AND AUTOMATA THEORY

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Write the difference between DFA and NFA.

2. Write the advantages of NFA with ε.

3. What is meant by non regular grammar? Give example.

4. Write regular expression for language over the input symbols $\Sigma = \{a,b\}$, in which each string of the language should have two consecutive 'a' and 'b' as substring.

5. Write the applications of pumping lemma.

6. Prove that the given language is not regular. $L = \{a^n, b^m \mid \text{where } n >= m\}$.

7. Write CFG for the language $L = \{a^{2n} b^n \mid \text{where } n >= 1\}$.

8. What is meant by unambiguous grammar? Give example.

9. Convert the given CFG into CNF.

   $S \rightarrow aS \mid bS \mid AB \mid \in$

   $A \rightarrow dA \mid \in$

   $B \rightarrow b$.

10. Eliminate left recursion of the given grammar:

    $S \rightarrow S + A \mid A \mid B$

    $A \rightarrow a$

    $B \rightarrow b$.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Prove that "If L is accepted by NFA with ε - transitions then L is accepted by an NFA without E- transitions". (10)

(ii) Write the applications of automata (6)

Or

(b) (i) Construct NFA-$\in$ for language to recognize odd number of 'a' or even number of 'b' over the input alphabet $\Sigma = \{a, b\}$. (8)

(ii) Construct NFA-$\in$ for the regular expression $a.(a \mid b)^*$ and convert it into DFA. (8)

12. (a) Write algorithm for generating regular expression from DFA. (16)

Or

(b) (i) Prove that all context free grammars are not regular grammar. (6)

(ii) Write the applications of regular expression. (6)

(iii) Write the characteristic of language for which regular expression can not be written. (4)

13. (a) State and prove the decision properties of Regular Expression. (16)

Or

(b) (i) Write algorithm for converting DFA into minimal DFA. (10)

(ii) State and prove pumping lemma for Regular Language. (6)

14. (a) Prove that CFLs are closed under union, concatenation and closure. (16)

Or

(b) (i) Construct PDA for language of Palindrome over input symbol $\Sigma = \{a, b\}$. (10)

(ii) Prove that the following grammar is not ambiguous. (6)

$E \rightarrow E + T \mid T$

$T \rightarrow T * F \mid F$

$F \rightarrow (E) \mid id$.

15. (a) Convert the following grammar into GNF (16)

$A_1 \rightarrow A_2 A_3$

$A_2 \rightarrow A_3 A_1 \mid b$

$A_3 \rightarrow A_1 A_2 \mid a$.

Or

(b) State and prove the emptiness, Finiteness and infiniteness of CFL. (16)

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