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Question Paper Code : 31146

11.5.13

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

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 × 2 = 20 marks)

1. Write the difference between DFA and NFA.

2. Give a DFA which accepts 0(00/11)*1.

3. Give regular expression for languages to accept strings over $\Sigma = \{a, b\}$ in which no string contains a substring 'aa' or 'bb'.

4. Write the limitations of regular expression and regular grammar.

5. Write the applications of pumping lemma.

6. How do you verify the 'emptiness' property of the regular language?

7. How do you prove that the grammar is 'ambiguous'?

8. Write CEG for language to accept strings over $\Sigma = \{a, b\}$ in which each string contains equal number of 'a' and 'b'.

9. Write the rules to apply pumping lemma for CFL.

10. What are the necessary conditions to be verified over the CFG before going to apply normal forms (CNF, GNF)?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Convert the regular expression $a(a \mid ab)^* b$ into NFA-$\in$ and then transform it into DFA. (10)

(ii) Write the applications of automata. (6)

Or

(b) (i) Write an algorithm to convert NFA into DFA. (8)

(ii) Write an algorithm to prove two automatas are equivalent. (8)

12. (a) Construct DFA for language to recognize strings over $\Sigma=\{a, b, c\}$ in which no string contain a substring '*aa*' or '*bb*' or '*cc*' (i.e no symbols ever follow itself). Generate regular grammar from the constructed DFA. (16)

Or

(b) Write the step by step mechanism to convert the regular expression $r=(a+b)^*(a+b)abb$ into NFA-$\in$. (16)

13. (a) Prove that the following languages are not regular. (16)

(i) $L=\{0^n 1^n \mid n>0\}$

(ii) $L=\{0^n \mid$ where n is prime$\}$

(iii) $L=\{ww \mid w \in \{0,1\}^*\}$

(iv) $L=\{xy \mid x, y \in \{0, 1\}^*\}$ and y is either x or $x^r\}$.

Or

(b) Construct minimum state automata for the following regular expressions : (16)

(i) $(0*10+1*0)(01)*$

(ii) $(010)*+1+(1*0)*$.

14. (a) Construct PDA 'M' to accept the strings of odd and even palindrome over the alphabets $\Sigma=\{a, b\}$. Also find ID for the input string w = *babab* from '*M*'. (16)

Or

(b) (i) Construct PDA to accept the strings of language $L=\{a^n b^n \mid n>0, w=(a,b)^*\}$. (8)

(ii) Prove the equivalence of PDA and CFG. (8)

15. (a) Find GNF for the CFG given below : (16)

$A \rightarrow BC$

$B \rightarrow CA \mid b$

$C \rightarrow AB \mid a$.

Or

(b) (i) Write the closure properties of CFL. (8)

(ii) Discuss about the decision properties of CFL. (8)
