Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 73384

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fifth Semester

Computer Science and Engineering

CS 2303/CS 53/10144 CS 504/CS 1303 — THEORY OF COMPUTATION

(Common to Seventh Semester Information Technology)

(Regulations 2008/2010)

(Also common to PTCS 2303 – Theory of Computation for B.E. (Part-Time)
Fifth Semester – CSE – Regulations 2009)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Define :
     (a)   Finite Automaton (FA)
     (b)   Transition diagram.

2.   State the principle of induction.

3.   List the operators used in the regular expression and their precedence.

4.   Mention any four Closure properties of Regular languages.

5.   Write the CFG for the language $L = \{a^n b^n | n \geq 1\}$.

6.   Compare NFA and PDA.

7.   State pumping lemma for CFL.

8.   What is chomsky normal form?

9.   Define – RE language

10. Differentiate recursive and non-recursive languages.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the steps in conversion of NFA to DFA. Convert the following Figure 11 (a) (i) NFA to DFA. (8)
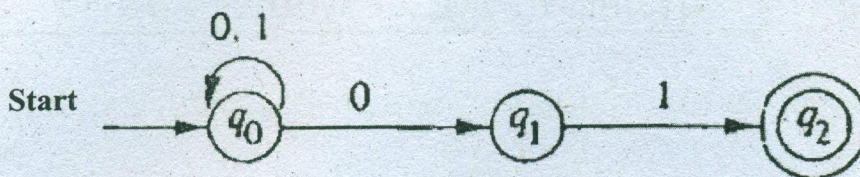

Figure 11 (a) (i)

(ii) Prove that, if L is accepted by an NFA with $\in$ transitions, then L is accepted by NFA without $\in$ transitions. (8)

Or

(b) (i) Prove the equivalence of NFA and DFA using subset construction. (8)

(ii) Give Deterministic Finite Automata accepting the following language over the alphapet.

(1) Number of 1's is a multiples of 3

(2) Number of 1's is not a multiples of 3. (8)

12. (a) (i) Using pumping lemma for the regular sets, prove that the language $L = \left\{ a^m b^n \mid m > n \right\}$ is not regular. (10)

(ii) Prove any two closure properties of regular languages. (6)

Or

(b) Construct a minimized DFA that can be derived from the following regular expression 0*(01)(0/111)*. (16)

13. (a) (i) Is the grammar $E \to E + E / E * E / id$ is ambiguous? Justify your answer. (6)

(ii) Find the context free languages for the following grammars.
(1) $S \to asbs / bsas / \varepsilon$
(2) $S \to asb / ab$. (10)

Or

(b) (i) Construct the PDA for $L = \left\{ ww^R / w \text{ is in} (a + b)* \right\}$. (10)

(ii) Discuss the equivalence between PDA and CFG. (6)

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14. (a) (i) Construct the following grammar in CNF :

S -> ABC | BaB

A -> aA | BaC | aaa

B -> bBb | a | D

C -> CA | AC

D -> ε . (8)

(ii) Discuss on Turing Machines. (8)

Or

(b) (i) List and explain the closure properties of CFL. (8)

(ii) Explain in detail about programming techniques for Turing Machines. (8)

15. (a) Explain post-correspondence problems and decidable and undecidable problems with examples.

Or

(b) Explain the class P and NP problems with suitable example.

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