Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 60386

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

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 — ($10 \times 2 = 20$ marks)

1. Mention the principle of mathematical induction.

2. Specify any two applications of finite automata.

3. What is regular expression? Mention the hierarchy of its operators.

4. Mention the difference between regular expression and regular language with an example.

5. What is the use of context-free grammar?

6. Is the grammar $E -> E + E \mid$ id ambiguous? Justify

7. What is Chomsky normal form?

8. Are the context free languages closed under intersection? Justify.

9. What is recursive language?

10. Mention the difference between decidable and undecidable problems.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Define finite automata. Explain the difference between non-deterministic and deterministic finite automata with an example. (8)

(ii) Construct a non-deterministic finite automata (NFA) with ε-transition(s) accepting set of all binary strings with n number of 0's followed by m number of 1's. Compute the ε-closure ( ) for state in the NFA. (8)

Or

(b) (i) Explain the method of constructing NFA without ε-transition for a NFA with ε-transitions. (8)

(ii) Construct deterministic finite automata (DFA) accepting set of all binary strings having 101 as a sub string. (8)

12. (a) (i) Prove that if L is accepted by a DFA, then L is denoted by a regular expression. (8)

(ii) What is pumping lemma for regular set? Explain its use with an example. (8)

Or

(b) (i) Construct NFA and DFA for the regular expression $(a/b)^* abb$. (10)

(ii) Explain the closure properties of regular languages. (6)

13. (a) (i) Let G be a grammar

$S -> aB \mid bA$

$A -> a \mid aS \mid bAA$

$B -> b \mid bS \mid aBB$

For the string abbaab find leftmost and rightmost derivations, and parse tree. Find the language accepted by the grammar. (10)

(ii) Construct push down automata for the grammar

$S -> aAA$

$A -> aS \mid bS \mid a$. (6)

Or

(b) (i) Construct push down automata for $L = \{a^n b^n \mid n >= 1\}$. (10)

(ii) Explain the equivalence between push down automata and context free grammar. (6)

14. (a) (i) Construct a Turing machine for $L = \{0^n 1^n \mid n \geq 1\}$. (10)

(ii) Obtain Greibach normal form of $S \rightarrow aSb \mid ab$. (6)

Or

(b) (i) Which of the following languages are context free? Justify it.

$(x) L = \{a^n b^n c^m d^m \mid n, m \geq 1\}$.

$(y) L = \{a^n b^m c^m d^n \mid n, m \geq 1\}$. (8)

(ii) Explain any two higher-level conceptual tools for Turing machine construction. (8)

15. (a) (i) Explain a language that is not recursively enumerable. (8)

(ii) Discuss the concept of P and NP problems with examples. (8)

Or

(b) (i) Discuss any two undecidable problems about Turing machine. (8)

(ii) Is the post correspondence problem undecidable? Justify your answer. (8)