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

Question Paper Code : 91403

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Fifth/Eighth Semester
Computer Science and Engineering
CS6503 – THEORY OF COMPUTATION
(Common to Information Technology)
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Define a deterministic finite automaton.
2. Draw the transition diagram for the deterministic finite automaton accepting all strings with a substring 01.
3. Define context free grammar.
4. What is a parse tree ? Give example.
5. Define pushdown automaton.
6. When a pushdown automaton can be defined to be deterministic ?
7. What is a Turing machine ?
8. Present an outline of multi-tape Turing machine.
9. When is a language L recursively enumerable ?
10. What are polynomial-time algorithms ?

PART – B (5×13=65 Marks)

11. a) Outline the steps in converting nondeterministic finite automaton to deterministic finite automaton. (13)

(OR)

b) "Not every language is a regular language". Using pumping lemma prove that many different languages are not regular. (13)

12. a) i) What are ambiguous grammars ? Give example. (6)

ii) When is a context free grammar said to be in Chomsky normal form ? Explain with an example. (7)

(OR)

b) i) Outline unit production and null production in a context free grammar with an example. (6)

ii) When is a context free grammar said to be in Greibach normal form ? Explain with an example. (7)

13. a) Given a context free grammar G, outline the steps to construct a pushdown automaton that simulates the left most derivations of G with an example. (13)

(OR)

b) Show that the language $L = \{0^n1^n \mid n \geq 1\} \cup \{0^n1^{2n} \mid n \geq 1\}$ is a context-free language that is not accepted by any deterministic pushdown automaton. (13)

14. a) Design a Turing machine that will accept the language $\{0^n1^n \mid n \geq 1\}$ and draw the transition diagram for the Turing machine. (13)

(OR)

b) i) Outline the halting problem for Turing machines. (5)

ii) Present an outline of the Chomsky hierarchy of languages. (8)

15. a) i) Present a detailed note on primitive recursive functions. (8)

ii) Highlight the features of universal Turing machine. (5)

(OR)

b) i) Outline tractable and intractable problems with an example. (8)

ii) Show that any problem in P is also in NP but not the other way around. (5)

PART – C **(1×15=15 Marks)**

16. a) Write regular expression for the following languages :

i) The set of all strings of 0's and 1's not containing 101 as a substring. (6)

ii) The set of strings of 0's and 1's, whose number of 0's is divisible by five and whose number of 1's is even. (9)

(OR)

b) Give transition tables for pushdown automata accepting each of the following languages :

i) $\{a^ib^j \mid i \leq j \leq 2i\}$ (7)

ii) $\{x \in \{a, b\}^* \mid n_a(x) < n_b(x) < 2n_a(x)\}$. (8)