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Question Paper Code : 80298

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

Fifth Semester

Computer Science and Engineering

CS 6503 — THEORY OF COMPUTATION

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Deterministic Finite Automata (DFA).
2. What are the closure properties of regular languages?
3. What is meant by Context Free Grammar (CFG)?
4. State Chomsky normal form theorem.
5. When is Push Down Automata (PDA) said to be deterministic?
6. What are the conventional notations of Push Down Automata?
7. What are the required fields of an instantaneous description of a Turing machine?
8. List the primary objectives of Turing machines.
9. Define Universal Turing machine.
10. Define NP-hard and NP-completeness problem.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Given $\Sigma = \{a, b\}$, construct a DFA which recognize the language $L = \{b^m a b^n : m, n > 0\}$. (6)

(ii) Determine the DFA from a given NFA $M = (\{q_0, q_1\}, \{a, b\}, \delta, q_0, \{q_1\})$ with the state table diagram for δ given below. (10)

δ	a	b
q_0	$\{q_0, q_1\}$	$\{q_1\}$
q_1	ϕ	$\{q_0, q_1\}$

Or

(b) Discuss the basic approach to convert from NFA to Regular expression. Illustrate with an example. (16)

12. (a) (i) Construct a Context Free Grammar for the language $L = \{a^n \mid n \text{ is odd}\}$ (6)

(ii) Define derivation tree. Explain its uses with an example. (10)

Or

(b) Obtain a grammar in Chomsky Normal Form (CNF) equivalent to the grammar G with the productions P given.

$S \rightarrow aAbB$

$A \rightarrow aA \mid a$

$B \rightarrow bB \mid b.$ (16)

13. (a) (i) Outline an instantaneous description of a PDA. (6)

(ii) State and explain the pumping lemma for CFG. (10)

Or

(b) With an example, explain the procedure to obtain a PDA from the given CFG. (16)

14. (a) Discuss the various techniques for Turing machine construction. (16)

Or

(b) (i) Write about Multi tape Turing machines. (10)

(ii) Explain highlight the implications of halting problems. (6)

15. (a) (i) Elaborate on primitive recursive functions with an example. (10)

(ii) Compare recursive languages with recursively enumerable languages. (6)

Or

(b) (i) What are tractable problems? Compare it with intractable problems. (10)

(ii) Outline the concept of polynomial-time reductions. (6)

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