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

Question Paper Code : 40395

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Fifth Semester

Computer Science and Engineering

CS 8501 — THEORY OF COMPUTATION

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Write regular expression to represent exponential constants of 'C' language.
2. Define extended transition diagram.
3. Write regular expression to recognize the set of strings over {a,b} having odd number of a's and b's and that starts with 'a'.
4. When two states are said to be distinguished? Give example.
5. Write CFG to accept the language defined by, $L = \{a^i b^j c^k | i, j, k >= 0 \text{ and } i = j + k\}$.
6. List out the steps for performing LL parsing.
7. Draw pushdown automata to accept all palindromes of odd length.
8. Formally define the pushdown automata based on the types of acceptance.
9. Draw Turing machine to compute double the value of an integer.
10. State Post's correspondence problem.

PART B — ($5 \times 13 = 65$ marks)

11. (a) Design an $\varepsilon - NFA$ (Nondeterministic finite automaton) to recognize the language L, containing only binary strings of non-zero length whose bits sum to a multiple of 3. Convert $\varepsilon - NFA$ into an equivalent minimized deterministic finite automaton. Illustrate the computation of your model on any sample input.

Or

(b) (i) State and prove the theorem of mathematical induction. (5)

(ii) In a programming language, all the following expressions represent Integer and floating point literals. Construct a finite automata that will accept all the different formats and convert the same to deterministic finite automata, if required. (8)

12. (a) (i) Prove that regular expressions are closed under union, intersection and Kleene closure. (8)

(ii) Identify a language L, such that L* = L+. (5)

Or

(b) Find a minimum State Deterministic Finite Automata recognizing the language corresponding to the regular expression (0*10 + 1 * 0) (01)*.

13. (a) What language over {0, 1} does the CFG with productions

$S \to 00S \mid 11S \mid S00 \mid S11 \mid 01S01 \mid 01S10 \mid 10S10 \mid 10S01 \mid \in$ generate? Justify your answer.

Or

(b) Design an pushdown automata to recognize the language, L defined by, L $L = \{wcw^c \mid w \in \{0,1\}^*$ and w^c is the one's complement of $w\}$.

14. (a) Convert the following grammar to Chomsky Normal form.

$S \to A \mid AB0 \mid A1A$

$A \to A0 \mid \in$

$B \to B1 \mid BC$

$C \to CB \mid CA \mid 1B$.

Or

(b) Construct an appropriate model to recognize the language L defined by, $L = \{a^n b^m c^m d^n \mid n, m >= 0\}$.

15. (a) With proper examples, explain P and NP complete problems.

Or

(b) State and prove that "Diagnoalization language is not recursively enumerable".

PART C — (1 × 15 = 15 marks)

16. (a) Design appropriate automation model for the language defined by the grammar given below.

$S \rightarrow aSBC$
$CB \rightarrow BC$
$bB \rightarrow bb$
$cC \rightarrow cc$

$S \rightarrow aBC$
$aB \rightarrow ab$
$bC \rightarrow bc$

Or

(b) Design appropriate automation model for the language defined by the grammar given below.

$S \rightarrow abc \mid aAbc$
$Ab \rightarrow bA$
$Ac \rightarrow Bbcc$
$bB \rightarrow Bb$
$aB \rightarrow aa \mid aaA.$