



0501CS221032

Sagar Institute of Research & Technology - Excellence, Bhopal
II Mid Semester Examination, December-2024

SEMESTER: V

BRANCH: CSE

Subject Code/ Name: CS-501 (THEORY OF COMPUTATION)

Time: 3:00 Hrs.

Max. Marks: 40

NOTE: Attempt all questions. Internal choice is provided in each question.

Q. No.	Question Description	COs (Course Outcomes)	Level (Bloom's Taxonomy)	Marks
Q. 1	(A) Define Ambiguity. Consider the grammar $E \rightarrow E+E E * E (E) id$. Find the leftmost, rightmost derivations and parse trees for the string $id+id*id$. And show that this grammar is ambiguous. OR	CO4	L3	8
	(A) Define CFG. Design CFG for the languages i) $L = \{0^{2n} 1^m \mid n \geq 0, m \geq 0\}$ ii) $L = \{0^i 1^j 2^k \mid i=j \text{ or } j=k\}$	CO4	L3	
Q. 2	(A) Construct the PDA to accept the language $L = \{a^n b^{2n} \mid n \geq 1\}$ by Final State	CO2	L3	16
	(B) Is the language wcw^k where w is string of zeroes and ones, accepted by DPDA? Why? OR (A) Define CNF. Convert the following CFG to CNF. $S \rightarrow aACa$ $A \rightarrow B/a \ B \rightarrow C/c$ $C \rightarrow cC/\epsilon$ Convert PDA equivalent to the given CFG with the following productions 1. $S \rightarrow A, A \rightarrow BC, B \rightarrow ba, C \rightarrow ac$ 2. $S \rightarrow aSb A, A \rightarrow bSa S \epsilon$	CO2	L3	
Q. 3	(A) Design a Turing machine that determines whether the binary input string is of odd parity or not (B) Explain Universal Turing machine simulate other Turing machines	CO2	L4	16
	(A) Design a Turing machine that accept language of all strings over the alphabet (a,b) for the language $L = \{a^n b^n \mid n \geq 1\}$ (B) Explain the following: Two way finite automata iii) Myhill Nerode theorem iv) NP hard problems v) Recursively enumerable set	CO2	L4	