 **SRM Institute of Science and Technology**

**College of Engineering and Technology**

**School of Computing**

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

**Academic Year: 2022-23 (ODD)**

**B.Tech-Computer Science & Engineering**

**Test: CLA-T2** **Date: 19.10.2022**

**Course Code & Title: 18CSC301T & Formal Languages and Automata Theory**  **Duration: 2 period**s

**Year & Sem: III Year /V Sem** **Max. Marks: 50**

***Set -D***

**Course articulation matrix:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | **PO 12** | **PSO 1** | **PSO 2** | **PSO 3** |
| **CO-1** | 3 |  |  |  |  |  |  |  |  |  |  |  |  |  | 3 |
| **CO-2** |  | 3 | 2 |  |  |  |  |  |  |  |  |  |  |  | 3 |
| **CO-3** |  | 3 | 3 |  |  |  |  |  |  |  |  |  |  |  | 3 |
| **CO-4** |  | 3 | 3 |  |  |  |  |  |  |  |  |  |  |  | 3 |
| **CO-5** |  |  | 3 | 1 |  |  |  |  |  |  |  |  | 2 |  | 3 |

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| **Part - A**  **Instructions: Answer any two questions** | | | | | | |
| **Q. No** | **Question** | **Marks** | **BL** | **CO** | **PO** | **PI Code** |
| 1 | 1. What is the use of Pumping lemma? (1 Mark) 2. To prove the equivalence of NFA and DFA 3. To prove the equivalence of ϵ-NFA and DFA 4. To prove that the language is not regular 5. To derive the equivalent regular expression from FSM   ii) Which among the following CFG derives only alpha numeric characters? (1 Mark)   1. S-->BA|AB|A|B; A-->0|1|..|9; B-->A|b|…|Z|a|b|…|z 2. S-->BA|AB|A; A-->0|1|..|9; B-->A|b|…|Z|a|b|…|z 3. S-->BA|AB|B; A-->0|1|..|9; B-->A|b|…|Z|a|b|…|z 4. S-->BA|AB; A-->0|1|..|9; B-->A|b|…|Z|a|b|…|z   iii) List the terminal and non-terminal symbols in the given grammar (3 Marks)  (iv) Derive the parse tree for the string “The short girl lives in the green house” (3 Marks)  (v) Check if the grammar could generate the string “The tall boy hided in the house” unambiguously? Justify your answer (5 Marks)  (vi) Convert the above CFG to Chomsky Normal Form (CNF) (12 Marks) | 25 | 3 | 2 | 4 | **4.2.1** |
| 2 | Consider the following grammar  Stmt → if Cond then Stmt  Stmt → if Cond then Stmt else Stmt  Stmt → while Cond do Stmt  Stmt → id = Expr  Stmt → id  Cond → id Relop id  Expr → id Op id  Expr → id  Relop → < │ > │ <= │>= │ == │ !=  Op → + │ - │ \* │ / │ %  id → a │ b │ c │ d │ e │ f   1. Which of the given languages are accepted by Non Deterministic PDA but not by Deterministic PDA? (1 Mark) 2. Language generating strings that contain at least one symbol repeated at least twice 3. Even length Palindromes 4. Strings ending with a particular symbol 5. Strings starting with particular symbol 6. Which of the following is not a simplification procedure of CFG? (1 Mark) 7. Elimination of null symbols 8. Elimination of unit productions 9. Elimination of generating symbols 10. Elimination of useless productions 11. Construct leftmost derivation for “while a<b do c=d” (4 Marks) 12. Construct rightmost derivation for “if a>b then c=d\*e” (4 Marks) 13. Prove that the grammar is ambiguous grammar by using   “if a<=b then if c>=d then e=f else f=e” (5 Marks)   1. Convert the CFG into PDA. (7 Marks) 2. Check whether the string “a=b/c” is accepted by PDA (3 Marks) | 25 | 3 | 2,3 | 4 | **4.2.1** |
| 3 | The esteem institute conducts the placement for all the final year students. The students participated in various rounds of the placements. One such round is choosing the pattern of the written exam. The student has to choose the questions in the order specified. The one who is choosing all the questions in the specified order of answering at the earliest is the winner. The questions are MCQ, FILL IN THE BLANKS, MATCH THE FOLLOWING, DESCRIPTIVE.  Case (i)  First, they should choose and answer ‘n’ number of MCQ then ‘2n’ number of FILL IN THE BLANKS then ‘m’ number of MATCH THE FOLLOWING and at last ‘m’ number of DESCRIPTIVE.  Case (ii)  Or else First, they should choose and answer ‘n’ number of MCQ then ‘3n’ number of FILL IN THE BLANKS then ‘p’ number of MATCH THE FOLLOWING and at last ‘2p’ number of DESCRIPTIVE.  The order should not be changed. Design the suitable pushdown automata to check the order and satisfies the above cases. Illustrate with an example pattern.   * + 1. The transition rule δ(q, b,Z)=(p,Z) represents \_\_\_\_\_\_\_\_\_\_\_\_\_ operation. (1 Mark)  1. Push 2. Pop 3. No change 4. no input   ii. Consider let LangA describes the languages accepted by PDA by final state and LangB is the languages accepted by empty stack. Then (1 Mark)  a) Both languages are equal  b) LangA is subset of LangB  c) LangB is subset of LangA  d) Nothing can be inferred from both languages  iii. Construct a PDA with accepting state for the given statement Case i) (8 marks)  iv. Construct a PDA with accepting state for the given statement Case ii) (8 Marks)  v. Formal Definition of Constructed PDA (4 Marks)  vi. Give the conversion of above constructed PDAs (case i) and ii)) to empty stack (3 Marks) | 25 | 4 | 3 | 4 | **4.2.1** |

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