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**PRESIDENCY UNIVERSITY**

**Bengaluru**

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| **End - Term Examinations –JANUARY 2025** |
| **Date:** 17 – 01- 2025 **Time:** 01:00 pm – 04:00 pm |

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| --- | --- | --- |
| **School:** SOCSE | **Program:** ISE/ISR | |
| **Course Code :** CSE2018 | **Course Name :** Theory of Computation | |
| **Semester**: III | **Max Marks**: 100 | **Weightage**: 50% |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** |
| **Marks** | **14** | **40** | **24** | **22** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Answer ALL the Questions. Each question carries 2marks. 10Q x 2M=20M** | | | | |
| **1** | Define Finite Automata? List its types | **2 Marks** | **L1** | **CO1** |
| **2** | Explain Kleen Closure with respect to language | **2 Marks** | **L1** | **CO1** |
| **3** | List the applications of finite automata | **2 Marks** | **L1** | **CO1** |
| **4** | Explain wn with respect to the string w=01. What will be the string if n is equal to 0. | **2 Marks** | **L1** | **CO1** |
| **5** | Explain power set with respect to the set Q={q0,q1,q2}. | **2 Marks** | **L1** | **CO1** |
| **6** | Define language? Write the language which accepts the set of strings having substring aab. | **2 Marks** | **L1** | **CO1** |
| **7** | Given L={01,110,101}. Explain the LR and L.L with respect to the given strings in the language | **2 Marks** | **L1** | **CO1** |
| **8** | Define Chomsky Hierarchy | **2 Marks** | **L1** | **CO3** |
| **9** | Define ambiguous grammar with example | **2 Marks** | **L1** | **CO3** |
| **10** | Define Turing Machine | **2 Marks** | **L1** | **CO4** |

**Part B**

|  |  |  |  |  |  |  |
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| **Answer the Questions Total 80 Marks.** | | | | | | |
| **11.** | **a.** | Construct a DFA accepting the set of string which ends with either 01 or 10. Also check whether the string 011101 and 110011 are accepted or rejected. | **10 Marks** | **L3** | | **CO2** |
|  | **b.** | Convert the following NFA into DFA   |  |  |  | | --- | --- | --- | |  | **a** | **b** | | **🡪p** | **{q,s}** | **{q}** | | **q** | **{r}** | **{q,r}** | | **r** | **{s}** | **{p}** | | **\*s** | **-** | **{p}** | | **10 Marks** | **L3** | | **CO2** |
| **or** | | | | | | |
| **12.** | **a.** | Construct a DFA accepting the binary numbers divisible by 5. Check the validity of the string 0101 and 1101 with the constructed DFA. | **10 Marks** | **L3** | **CO2** | |
|  | **b.** | Construct an NFA which accepts set of strings ending with ab and convert the same into equivalent DFA. | **10 Marks** | **L3** | **CO2** | |
|  |  |  |  |  |  | |
| **13.** | **a.** | Construct the epsilon NFA using Thomson construction for the given regular expression a\*b\*(c+d)\* | **5 Marks** | **L3** | **CO2** | |
|  | **b.** | Minimize the following DFA using state minimization methodMinimization of DFA - GeeksforGeeks | **8 Marks** | **L3** | **CO2** | |
|  | c. | State pumping lemma theorem. Prove that the language L={anbn; n>=1} is not regular using pumping lemma theorem. | **7 Marks** | **L3** | **CO2** | |
| **or** | | | | | | |
| **14.** | **a.** | Compute the E-closure of all the states in the given epsilon NFA. Convert the same into equivalent DFA | **10 Marks** | **L3** | **CO2** | |
|  | **b.** | Minimize the following DFA using state minimization method  finite automata - Is this DFA has already been minimized? - Stack Overflow | **10 Marks** | **L3** | **CO2** | |

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| **15.** | **a.** | Construct a PDA for the language L={wCwR| w contains a’s and b’s} also write the instantaneous descriptor for the given string aababCbabaa | **10 Marks** | **L3** | **CO3** |
|  | **b.** | Construct the CFG for the following languages on a’s and b’s also write the grammar   * + 1. anb2n such that n>=1     2. CFG containing equal number of a’s and equal number of b’s     3. CFG accepting string followed by its reversal i.e., wwR | **10 Marks** | **L3** | **CO3** |
| **Or** | | | | | |
| **16.** | **a.** | Construct a PDA for the language L={0n1n| n>=1} also write the instantaneous descriptor for the given strings 000111 and 00111 | **10 Marks** | **L3** | **CO3** |
|  | **b.** | Check whether the following CFG are ambiguous or not  E->E+E/ E\*E/ (E)/id  S-> AaA and A->aA|bA|ε | **10 Marks** | **L3** | **CO3** |

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| **17.** | **a.** | Construct a Turing machine for the language L={anbncn | n>=1} also write the instantaneous descriptor for the string aaabbbccc | **12 Marks** | **L3** | **CO4** |
|  | **b.** | Construct the Turing machine for the language L={w101| w Ԑ (0+1)\* | **8 Marks** | **L3** | **CO4** |
| **Or** | | | | | |
| **18.** | **a.** | Construct a Turing machine for the language L={1n02n| n>=1} also write the instantaneous descriptor for the string 110000 | **12 Marks** | **L3** | **CO4** |
|  | **b.** | Construct a Turing machine for the strings that has substring aaba | **8 Marks** | **L3** | **CO4** |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***