**Bahria University, Islamabad Campus**

Department of Computer Science

**Final Paper**

Class/Section: BSCS 4A,B MSCS 1A

**(Spring 2021 Semester)**

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| Course: | **Theory of Automata** | Date: 13/07/2021 |
| Course Code: | CSC-315 | Session: I |
| Faculty’s Name: | Dr. Sabina Akhtar | Max Marks: 50 |
| Time Allowed: | 2.5 hours | Total Pages: 6 (including this) |

Student’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Enroll No:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(USE CAPITAL LETTERS)

Invigilator(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Invigilator Signatures:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **INSTRUCTIONS:**   1. Paper must be solved on this booklet. Anything written outside the box will **NOT** **BE MARKED**. 2. Rough sheet given by the invigilator can be used but should **NOT** be attached along with the paper. 3. There are total five questions. All questions are compulsory. The paper is closed book. 4. The students are not allowed any helping material (books, tables, formulas, etc). 5. Use blue, black or blue-black ink only. Do **NOT** use lead pencil especially. 6. You cannot claim rechecking in case of cutting or overwriting inside the box. 7. The paper is self-explanatory.   ***Don’t write in the table below!*** |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | ***Question Number*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***Total*** | | ***Maximum Marks*** | ***10*** | ***10*** | ***10*** | ***10*** | ***10*** | ***50*** | | ***Marks Obtained*** |  |  |  |  |  |  | |

**Question # 1: Design Deterministic Finite Automata for the language of following regular expressions. Note that constructing the DFA from the given regular expression is not required, it will probably waste time. Just reason out the DFA directly.**

**(marks: 3+3+4 = 10)**

1. **01\***

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1. **(0+1)01**

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|  |

1. **00(0+1)\***

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**Question # 2: Here is a context free grammar G = ({S,A,B},{0,1,2},P,S) where P is the set of productions:**

**S → AB | BA | A | B | ε**

**A → 2 | 2A**

**B → 01 | 0B1**

**(marks: 3+3+4 = 10)**

1. **Give a leftmost derivation of the string 001122.**

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1. **Give a rightmost derivation of the string 00211.**

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1. **Draw a parse tree for the string 2220011.**

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**Question # 3: Solve the following: (marks 3 + 3 + 4=10)**

A picture containing shape

Description automatically generated

* + 1. **Is the above machine moore or mealy?Why?**

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|  |

* + 1. **Draw transition table for the above machine**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Present**  **state** | **Input \_\_\_\_\_** | | **Input \_\_\_\_** | |
| state | output | state | output |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

* + 1. **Provide regular expressions for the following languages over the Σ = {0, 1}.**
       1. **The set of strings of 0’s and 1’s with at most one pair of consecutive 0’s.**

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* + - 1. **L = { w | w is a binary string that contains odd number of 0’s in the string}**

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**Question # 4: Simulate w = 00100 using the following Turing Machine.**

**(marks: 10)**



Table

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**Question # 5: Prove that the following language is not context free language using *Pumping Lemma*.**

**L = {0k1n2m | where k<n<m, k>=0, n>=0, m>=0}**

**(marks: 10)**

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**End of Assessment**