**TABLE OF SPECIFICATIONS FOR EXAM QUESTIONS**

**University of Liberal Arts Bangladesh**

**Department: Computer Science and Engineering (CSE)**

**Final Examination, Semester: Summer 2020**

**Program: B.Sc. in CSE**

**Course Code: CSE417 Course Title: Automata and Theory of Computation Credit Hr: 3**

**Time: 2 Hours Total Marks: 25**

**Name & Designation of the Examiner: Satyaki Das, Lecturer**

**Learning Outcomes (LO):**

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| 1. **Describe** the principles and concept of automata along with its benefits. |
| 1. **Explain** features of state machines to design and develop solutions |
| 1. **Solve** a wide range of practical problems for automata and formal languages. |
| 1. **Understand** real-life problem and **be able** to design the solution using automata. |
| 1. **Design and develop** solutions to real-life problems. |

***Levels in Bloom’s Cognitive Domain:***

***C1: Remember C2: Understand C3: Apply C4: Analyze C5: Evaluate C6: Create***

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Question No.** | **Learning Outcomes (CO)** | **Level in Bloom’s Cognitive Domain along with Allocation of Marks** | | | | | |
|  |  | **C1** | **C2** | **C3** | **C4** | **C5** | **C6** |
| 1a | 1 | 2 |  |  |  |  |  |
| 1b | 4 |  |  | 3 |  |  |  |
| 2a | 2 |  | 1 |  |  |  |  |
| 2b | 2 |  | 1 |  |  |  |  |
| 2c | 5 |  |  | 2 |  |  |  |
| 2d | 5 |  |  | 2 |  |  |  |
| 2e | 5 |  |  | 2 |  |  |  |
| 3a | 3 |  | 1 |  |  |  |  |
| 3b | 5 |  |  | 4 |  |  |  |
| 3c | 4 |  |  |  | 3 |  |  |
| 4a | 4 |  |  |  | 2 |  |  |
| 4b | 4 |  |  | 2 |  |  |  |
| **Total Allocation of Marks** | **25** | 2 | 3 | 15 | 5 |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Question No.** |  | **Learning Outcome** | | | | | |
|  |  | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** | **CO6** |
| 1a |  | 2 |  |  |  |  |  |
| 1b |  |  |  |  | 3 |  |  |
| 2a |  |  | 1 |  |  |  |  |
| 2b |  |  | 1 |  |  |  |  |
| 2c |  |  |  |  |  | 2 |  |
| 2d |  |  |  |  |  | 2 |  |
| 2e |  |  |  |  |  | 2 |  |
| 3a |  |  |  | 1 |  |  |  |
| 3b |  |  |  |  | 3 |  |  |
| 3c |  |  |  |  |  | 4 |  |
| 4a |  |  |  |  | 2 |  |  |
| 4b |  |  |  |  | 2 |  |  |
|  |  |  |  |  |  |  |  |
| **Total Allocation of Marks** | **25** | 2 | 2 | 1 | 10 | 10 |  |

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**Signature of the Examiner Date: 28.09.2020**

**Department of Computer Science and Engineering**

**University of Liberal Arts Bangladesh**

**Final Examination (Summer 2020)**

**Course: Automata and Theory of Computation (CSE 417)**

**Section: 2 --- Duration: 2 Hours**

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**PLEASE ANSWER ALL QUESTIONS. Total 25 Marks**

**QUESTION 1 (2+3=5 Marks)**

1. What is minimal DFA?
2. Design the DFA that accepts the strings that start and end with the same symbol. Assume that, Σ= {a, b}.

**QUESTION 2 (1+1+2+2+2=8 Marks)**

1. Construct the Regular Expression (RE) that accepts the binary equivalent of even numbers.
2. Construct another RE that does the same for odd numbers.
3. Let’s name them R1 and R2. Design the NFA for RE = R1| R2.
4. Convert the NFA to DFA.
5. Minimize the DFA.

**QUESTION 3 (1+3+4=8 Marks)**

1. Both the Pushdown Automata (PDA) and Turing Machine (TM) have a tape. Explain the key difference between these two types of tapes.
2. TheContext Free Grammar (CFG) for a binary string that is also an even palindrome is: S → 0S0 | 1S1 | Ɛ. Generate the string “101101” using parse tree.
3. Construct the PDA for the above CFG.

**QUESTION 4 (2+2=4 Marks)**

1. Suppose you have a binary number as a string. Write an algorithm that will increment the decimal value of the number by 1.
2. Design a Turing Machine that implements your algorithm.

**\*\*END OF QUESTIONS\*\***