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| **National University of Computer and Emerging Sciences, Lahore Campus** | | | | |
|  | **Course:** | **Theory of Automate** | **Course Code:** |  |
| **Program:** | **BS (Computer Science)** | **Semester:** | **Fall 2025** |
| **Topic:** | **Finite Automata** | **Total Marks:** | **100** |
| **Due Date:** | **3rd September, 2025** | **Weight** | **%** |
| **Section:** | **3F, 3J & 5J** | **Page(s):** | **1** |
| **Exam:** | **Assignment 1** | **Reg. No** |  |

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| **Instruction/Notes:** | This is handwritten assignment which is to be submitted in google classroom. |

**Problem # 1:** Draw deterministic finite automata of the following languages over alphabets ∑ = {a,b}. Also enumerate each language.

1. {x / x Ɛ ∑\* & x does not contain the substring abaa}
2. The language of the strings that start and end with aba.
3. The language of all strings containing even number of a’s and each a is followed by at least two b’s.
4. The language of all strings containing both aa and bab as substrings.
5. {x / x Ɛ ∑\* & |x| is some multiple of 3 & x has odd number of a’s.
6. The language of all strings in which every pair of adjacent b’s appear before any pair of adjacent a’s.
7. The language of all strings containing at least two a’s and at most one b.
8. The language of all strings whose first two letters are the reverse of last two letters.
9. The language of all strings containing no more than two occurrence of the string aa.
10. The language of the strings such that each block of four consecutive symbols contains at least two b's.
11. The language of the strings such that the number of a's is divisible by five, and the number of b's is divisible by 3.

**Problem 2**:

∑ = {0,1}

L1 = {x | x Є ∑\*, where x has at least three 0’s and all strings containing no more than one occurrence of the substring 11. (The string 111 should be viewed as containing two occurrences of 11).

1. Construct deterministic finite automata (DFA) for the language given above.
2. Process the string 011000 on DFA