INDIAN STATISTICAL INSTITUTE

Mid-Semester Examination

M. Tech. (CS) I year (2nd Sem): 2024–2025

Automata Theory, Languages and Computation

Date: 24. 02. 2025 Marks : 40 Time : 2 Hours

Answer all questions.

Please try to write all the part answers of a question at the same place.

1. Construct a DFA to recognize all strings over $\{a, b\}$ that begin with a, but do not contain aab as a substring. [10]

2. Argue that any DFA that recognizes the language represented by the regular expression $(ab)^* + a$ requires at least 4 states. [10]

3. Derive regular expression for the complement of $L(a^*b(aa)^*)$. [10]

4. Is the following language regular or irregular? Prove your claim. [10]

$$L = \{a^n : n \text{ is divisible by 2 or 3 or 5}\}.$$