B.Sc. Degree Examinations - Even Semester 2021
III Year VI Semester
Formal Languages and Automata Theory

Max Marks: 25

Answer any Five questions $(\mathbf{5 \times 5 = 25})$

1. Find a context-free grammar to generate the language $L = \{wcw^R : \ w \text{ is in } \{a, b\}^*\}$, where w^R is w written in reverse order.
2. Find a regular grammar to generate the language $L = \{w : w \text{ is in } \{a, b\}^+ \text{ and } w \text{ does not contain two consecutive } a's\}$.
3. Define intersection of two languages. Show that the family of CFL is not closed under intersection.
4. Construct a context-free grammar in Greibach normal form which is equivalent to the grammar $G = (N, T, P, S)$ where $N = \{S, S_1\}, T = \{a, b\}$ and $P = \{S \to S_1S,\ S \to S_1,\ S_1 \to aS_1b,\ S \to ab\}$.
5. Show that if L is accepted by an NFA with ϵ-transitions, then L is accepted by an NFA without ϵ transitions.
6. Let $M = (\{q_0, q_1\}, \{0,1\}, \delta, q_0, \{q_1\})$ be an NFA where $\delta(q_0, 0) = \{q_0, q_1\}$. $\delta(q_0, 1) = \{q_1\}$, $\delta(q_1, 0) = \phi$, $\delta(q_1, 1) = \{q_0, q_1\}$. Construct a deterministic finite automata to accept $L(M)$.
7. State and prove the pumping lemma for regular s0ets.