Assignment 2

Overview

This assignment satisfies the following learning objectives of the course:

- Develop inductive definitions based on mathematical induction
- Construct finite automata and grammars for regular languages

This assignment contains 6 questions and 40 points.

Rules and Deliverables

- This is an individual assignment.
- Cheating of any kind is NOT tolerated! Assignments will be checked against each other, and illegal collaboration will be treated based on the University dishonesty policy.
- The due date will be **Saturday 9/28/2024 at 11:59pm**.
- Submitting the assignment 24 hours after the due date will result in a deduction of 20% from the student's grade.
- Each student should submit:
    1. The answers document in a PDF format.
    2. The complete name and EUID of students must be written within the document.
- The assignment must be submitted only through Canvas.

Assignment Description

1. Find an inductive definition for each set S. In this question, N is the set of Natural numbers and includes 0. (4 points)
    a) S: {1, 5, 13, 29, 61, …}
    b) S: $\{a^{2n} \mid n \in N\} \cup \{a^{2n+1} \mid n \in N\}$

2. Define a grammar for each of the following languages: (6 points)
    a) L = {bb, bab, baab, baaab, ... }
    b) $\{a^n \mid n \in N\} \cup \{bc^n \mid n \in N\}$ * N is the set of Natural numbers and includes
    c) aa*cbb*d $\sum = \{a,b,c,d\}$

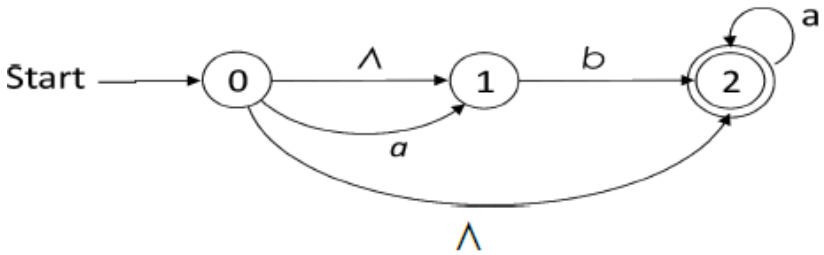
3. Construct an NFA for the following languages. (6 points)

   i. (a + b)*a

   ii. (ab + abc)*

4. **(A)** Convert the following NFA to equivalent DFA. (**B**) Show the steps for the conversion. (10 points)

   Over alphabet {a , b}. Hint: Symbol ∧ is another notation for empty string (ε)



5. What is the NFA of the following regular grammar? (4 points)

   S → abS | aS | ba

6. Convert the following NFA to an equivalent Regular Expression using **GNFA method**. Please first delete state B, then state S, and finally state A. (10 points)