JUST A TEST

Q1. Regular Expression

   (a) All strings over {a, b} that start and end with the same symbol
       a(a|b)*a | b(a|b)*b | a | b

   (b) All binary strings representing powers of 2
       (1—0)*0

   (c) All binary strings that do not contain two consecutive zeroes
       (1|01)*(0|ϵ)

   (d) Lowercase alphabet strings that start and end with a vowel (a, e, i, o, u)
       (a|e|i|u|o)[a-z]*(a|e|i|u|o)

   (e) Alphanumeric passwords with at least one uppercase, one lowercase, or one digit
       [A-Za-z0-9]+

Q2. DFA & NFA

   (a) DFA for all binary strings representing odd numbers.
       Basically, we want binary strings that end with 1

   (b) DFA for strings over {a, b} that contain the substring "aba"

   (c) DFA for binary strings divisible by 4

   (d) DFA for hexadecimal strings representing powers of 2

Q3. Write a Context-Free Grammar for polynomial expressions. Terms can be sorted in any order, for simplicity. Use the ˆ character to denote superscript exponents.

First, we have the Terminals

- $\{+, -, *, /, \hat{}\ \}$
- $\{0,1,2,3,4,5,6,7,8,9\}$ or [0-9]

Then, we have the Non-terminals

$$< \text{polynomial} > ::= < \text{expression} >$$

$$< \text{expression} > ::= < \text{expression} > + < \text{term} >$$
$$|\ < \text{expression} > - < \text{term} >$$
$$|\ < \text{term} >$$

$$< \text{term} > ::= < \text{term} > * < \text{factor} >$$
$$|\ < \text{term} > / < \text{factor} >$$
$$|\ < \text{factor} >$$

$$< \text{factor} > ::= < \text{number} > \hat{}\ < \text{number} >$$
$$|\ < \text{number} >$$

$$< \text{number} > ::= < \text{digit} >< \text{number} >$$
$$|\ < \text{digit} >$$

$$< \text{digit} > ::= [0-9]$$