American Computer Science League

2019-2020 — **Contest #3**

INTERMEDIATE DIVISION SOLUTIONS

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1. Boolean Algebra

$$A(\overline{B} + C) + B(A + \overline{C}) + \overline{ABC}$$
$$= A\overline{B} + AC + AB + B\overline{C} + \overline{A} + \overline{B} + \overline{C}$$
$$= \overline{A} + A\overline{B}(A + 1) + \overline{C}(B + 1) + AC + AB$$
$$= \overline{A} + \overline{B} + \overline{C} + A(B + C)$$
$$\overline{A} + \overline{B} + \overline{C} + A(B + C) = 0$$
$$\rightarrow \overline{A} = 0 \wedge \overline{B} = 0 \wedge \overline{C} = 0 \wedge A(B + C) = 0$$
$$\rightarrow A = 1 \wedge B = 1 \wedge C = 1 \wedge 1^*(1 + 1) = 0$$

which is impossible

So none make it FALSE

,

1. 0

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2. Boolean Algebra

$$\overline{A(B+C)} + \overline{B}(\overline{A}+C)$$
$$= \overline{A} + \overline{B+C} + \overline{A}\overline{B} + \overline{B}C$$
$$= \overline{A} + \overline{B}\overline{C} + \overline{A}\overline{B} + \overline{B}C$$
$$= \overline{A} + \overline{B}(\overline{C} + \overline{A} + C)$$
$$= \overline{A} + \overline{B} \text{ or } \overline{AB}$$

2. $\overline{A} + \overline{B}$ *or* $\overline{AB}$

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3. Data Structures

There are 5 with only 1 child: W, C, E, N, C.

The following is the binary search tree for:
WINDSORCONNECTICUT

3. 5

ACSL

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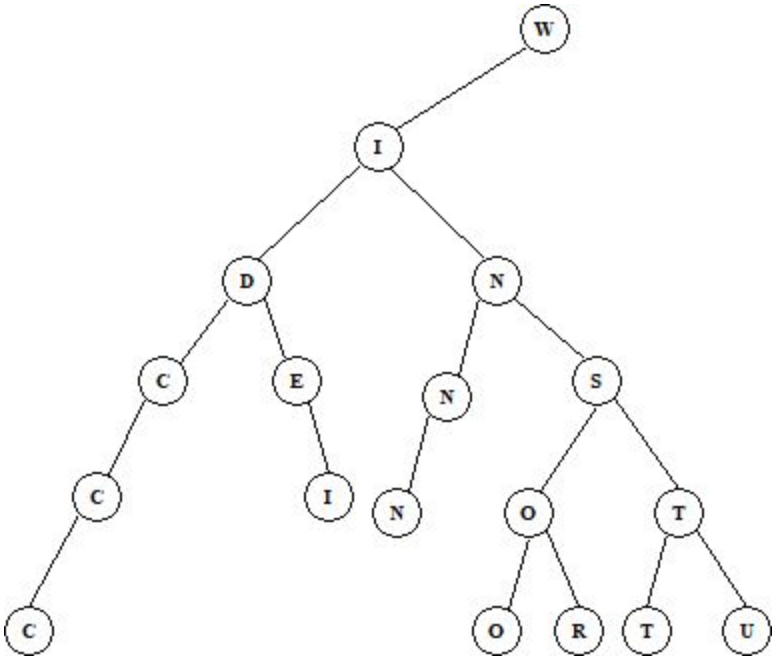

4. Data Structures

The stack is constructed using LIFO as follows:

T, TH, THE, THEK, THE, TH, THI, THIN, THI, THIG,
THIGA, THIGAN, THIGA, THIG, THI, THID, THIDI,
THID, THI

The next item popped would be I.

4. I

5. FSA's and Regular Expressions

Regular expression: a b * b a a * b a a
The string must start with a single "a" which eliminates B.
It must end with "a b a a" which eliminates C and D.
Both A and E can be formed from the expression.

5. A, E