ACSL

2016 - 2017 **American Computer Science League** **Contest #3**

Senior Division Solutions

1. Boolean Algebra

$$\overline{A}(B+\overline{A})+A\overline{B}+B(A+\overline{A}B) = \overline{A}B+\overline{A}\overline{A}+A\overline{B}+BA+B\overline{A}B$$
$$= \overline{A}B+\overline{A}+A\overline{B}+AB+\overline{A}B = \overline{A}(B+1)+A(\overline{B}+B)$$
$$= \overline{A}+A=1$$

1. 1

2. Boolean Algebra

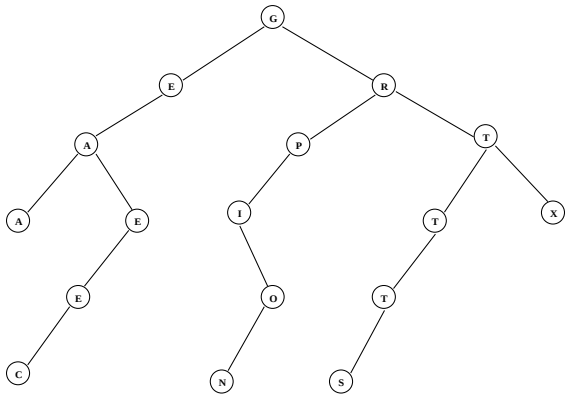
$\overline{A(\overline{B+C})} = \overline{A}+\overline{\overline{B+C}} = \overline{A}+B+\overline{C}$

$\overline{A}+B+\overline{C}$ = 0 only when each term is 0.
This only happens for (1, 0, 1).
Therefore 7 ordered triples make the expression TRUE.

2. 7

3. Data Structures

The binary tree formed is shown on the right.
The nodes with 2 children are:
G, A, R, and T.



3. G, A, R, T

4. Data Structures

The queue is constructed using FIFO as follows: M, MI, MIS, IS, ISS, ISSH, SSH, SH, SHA, HA. Switch to a stack.
The stack is constructed using LIFO as follows: HAV, HAVI, HAV, HAVS, HAVSH, HAVSHA, HAVSH, HAVSHM, HAVSH, HAVS.
The next element popped would be S.

4. S

5. Regular Expressions and FSA's

a. fails at the last b.
b. fails after the second b.
c. fails after the first a.
e. fails at the fourth a.

5. d