American Computer Science League

2022-2023 ● Contest 3: Short Problems ● Intermediate Division

1. Boolean Algebra

Simplify the following Boolean expression:

$$\overline{A}(A + \overline{B}) + \overline{A}\,B$$

A. A
B. $\overline{A}$
C. $\overline{A}\,B$
D. $\overline{B}$
E. 1

2. Boolean Algebra

How many ordered triples make this expression TRUE?

$$\overline{(A\,\overline{B} + C)}\;\overline{(B\,\overline{C} + A)}$$

A. 1
B. 2
C. 4
D. 5
E. 7

3. Data Structures

Build a binary search tree for the following string:

P R E A K N E S S S T A K E S

List all of the nodes that have only a left child.

A. A, E, S
B. E, S, S
C. E, R, S
D. R, S, S
E. S, S, S

4. Data Structures

Given an initially empty queue and the following commands on the queue, what item will be popped next?

PUSH("R"), PUSH("O"), PUSH("M"), X=POP(), X=POP(), PUSH("E"), PUSH("O"), X=POP(), X=POP(), PUSH("A"), X=POP(), PUSH("N"), PUSH("D"), PUSH("J"), PUSH("U"), X=POP(), PUSH("L"), X=POP(), PUSH("I"), PUSH("E"), X=POP(), X=POP(), PUSH("T"), X=POP()

A. U
B. I
C. E
D. L
E. T

5. FSAs and Regular Expressions

Given the following regular expression:

[b-ps-z]*[aei][j-p]*

How many of the following dance names satisfy this expression?

waltz	tango	chacha	polka
samba	foxtrot	charleston	paso
salsa	rhumba	mambo	quickstep

A. 0
B. 1
C. 2
D. 3
E. 4