

Question - 1

SCORE: 5 points

Red-Black Tree

Which of the following about Red-Black Tree is correct?

- ☐ Every path from root to null link has the same number of RED links
- ☒ Every path from root to null link has the same number of BLACK links
- ☐ Every path from root to null link has the same number of (RED + BLACK) links
- ☐ None of the above

Question - 2

SCORE: 5 points

2-3 Tree and Red-Black Tree

Which of the following about 2-3 Tree and Red-Black Tree is correct?

- ☐ Only Red-Black Tree is "perfectly balanced"
- ☐ Both 2-3 Tree and Red-Black Tree are "perfectly balanced"
- ☒ 2-3 Tree is "perfectly balanced" and Red-Black Tree is "perfectly BLACK balanced"
- ☐ 2-3 Tree is "perfectly balanced" and Red-Black Tree is "perfectly RED balanced"
- ☐ None of the above

Question - 3

SCORE: 5 points

Question 4

Is the following statement true? A Red-Black Tree which is also a perfect Binary Tree has all black nodes.

- ☒ True
- ☐ False

Question - 4

SCORE: 5 points

Red-black trees

Which of the following statements about a red-black tree are true?

- ☐ A red-black tree is a type of balanced search tree.
- ☐ A red-black tree of order 3 is logically equivalent to a 2-3 binary tree.
- ☐ A red-black tree of order 4 is logically equivalent to a B-tree of order 4
- ☒ All of the above

Question - 5

SCORE: 30 points

Red-Black Tree Implementation

Please implement `put()` and `rotateLeft()` for Red-Black Tree. (15 pts for each)

`put()`: Line 72

`rotateLeft()`: Line 94

* You don't need to change other code.

* There is no `main()` method. Please use "Run Unit Tests" to test your code.

* Unit tests for this question takes some time. Please be patient while compiling...