Started on	Monday, 19 April 2021, 6:40 PM
State	Finished
Completed on	Monday, 19 April 2021, 7:15 PM
Time taken	34 mins 53 secs

Question **1**

Incorrect

Marked out of 1.00

Consider a method with signature "public void method (boolean a, boolean b, boolean c)", which <mark>is known to have path-complete test cases.</mark>

Which one of the following statements is CORRECT?

Select one:

○ a. If the minimum number of branch-complete test cases is 4, then the minimum number of path-complete test cases is no more than 7.

○ b. If the minimum number of statement-complete test cases is 4, then the maximum number of branch-complete test cases is no more than 4. Already give a general structure

○ c. If the <mark>minimum number of branch-complete test cases is 4</mark>, then the <mark>maximum number of statement-complete test cases is not more than 8</mark>. Always true. 2^3

○ d. If the minimum number of path-complete test cases is 4, then the minimum number of statement-complete test cases is no more than 3.

◉ e. None of these statements. ✗

Question **2**

Correct

Marked out of 1.00

You build a red black tree by adding the following nodes in this order:

71, 8, 42, 12, 77, 31

If you walk in the final tree using the pre-order approach, what will be the CORRECT node and color output?

Select one:

○ a. 71 BLACK, 31 RED, 12 BLACK, 77 RED, 8 RED, 42 BLACK

○ b. None of these outputs.

◉ c. 42 BLACK, 12 BLACK, 8 RED, 31 RED, 71 BLACK, 77 RED ✓

○ d. 8 RED, 31 RED, 12 BLACK, 77 RED, 71 BLACK, 42 BLACK

○ e. 42 BLACK, 12 BLACK, 77 RED, 31 RED, 71 BLACK, 8 RED

Marked out of 1.00

If you insert the following keys to an empty B-tree of degree 3: 23, 12, 9, 2, 1

Which of the following are the keys in the root?

Select one:

- a. 2, 12
- b. 2, 9 ✖
- c. 3, 9
- d. 1, 12
- e. None of the mentioned keys.

Question **4**

Correct

Marked out of 1.00

Which one of the following $T(n)$ is the second slowest in asymptotic analysis?

Select one:

- a. $T(n) = T(n/4) + O(n^{1.3})$
- b. $T(n) = 4 \cdot T(n/4) + O(n)$
- c. All of these are the same in asymptotic analysis.
- d. $T(n) = 4.9 \cdot T(n/5) + O(n)$
- e. $T(n) = 5.6 \cdot T(n/5) + O(n^{1.05})$ ✔

Marked out of 1.00

What is the running time of the following method? Assume that method c() requires a constant number of operations.

```
public void method(int n) {
        c();
        for (int j = 0; j < n; j++) {
            for (int i = 0; i < j; i++) {
                for (int y = 0; y < n; y++) {
                    c();
                }
            }
        }
}
```

Select one:

- a. $\Theta(n^2)$
- b. None of these claims is true.
- c. $O(n)$
- d. $O(n^2)$
- e. $\Omega(n^2 \log n)$ ✔

Question **6**

Incorrect

Marked out of 1.00

What is the black-height of the root of a red-black tree with a height 5?

Select one:

- a. The black-height is at most 2.
- b. The black-height is at most 3. ✘
- c. None of these claims is true.
- d. The black-height is at least 4.
- e. The black-height is at least 1.

Marked out of 1.00

Which one of the following statements is INCORRECT about Git?

Select one:

- a. The command "git pull" incorporates changes from a remote repository into the current branch.
- b. Git is a distributed version control system.
- c. To clone a repository into a newly created directory, you have to use the command "git clone". To create an empty Git repository, you have to use the command "git init".
- d. Usually, after you commit a file, you send it to the remote repository using the command "git update". ✔
- e. None of these statements.

Question **8**

Incorrect

Marked out of 1.00

Root is internal node

If a red-black tree has n internal nodes and a height h. Which one of the values of n and h are possible?

If a red-black tree has n internal nodes and a height h.

Select one:

- • h <= 2 log(n + 1)]

- a. n = 4, h = 4
- •n = 3, h = 3: 3 < 2 log 4 = 4
- •n = 4, h = 4: 4 < 2 log 5 = 4.64
- b. n = 6, h = 6
- •n = 5, h = 5: 5 < 2 log 6 = 2 (2.585)
- c. n = 5, h = 5
- •n = 6, h = 6: 6 > log 7 = 2 (2.8)
- d. n = 3, h = 3
- • Hence, none of these values is possible. ✖
- e. None of these values is possible.
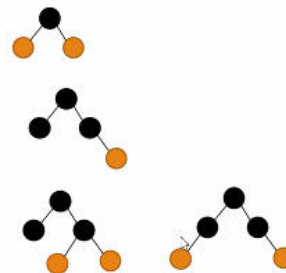
Question **9**

Correct

Marked out of 1.00

Which one the of following statements is INCORRECT?

Select one:

- a. In JUnit version 4, if you want to execute the method Y once after all tests in a class, you have to annotate the method Y with @AfterClass.
- b. In JUnit version 4, if you want to execute the method Y once before any test, you have to annotate the method Y with @Before.
- c. None of these statements.
- d. The JUnit command assertNull(x) does not fail if the Boolean variable "x" is not null. ✔
- e. JUnit is a well-known Java library for unit tests. Unit tests are automated tests that check whether the code is behaving as expected.

Consider the following method.

```
public void method(int a, boolean b, boolean c) {
switch (a) {
    case 1:
            if (b && (!c))
                    System.out.println("111");
            break;
    case 2:
            if (b || c)
                    System.out.println("110");
    case 3:
            if ((!b) ^ c)   XOR
                    System.out.println("100");
            break;
}
```
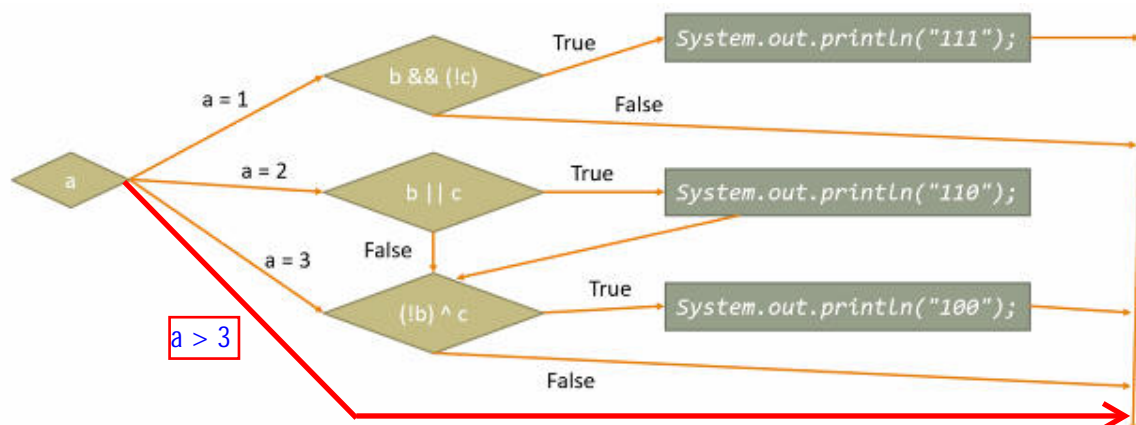
Hints:
- The number of paths is 2 + 4 + 2 = 8
- The minimum number of path-complete test cases is 8
- The maximum of test cases (a = 1/2/3/Else, b = True/False, c = True/False)
- The maximum number of test cases is 4 x 2 x 2 = 16
- The minimum number of branch-complete test cases is 5. Hence, a) is correct
  - a = 1, b && (!c) = True
  - a = 1, b && (!c) = False
  - a = 2, b || c = True, (!b) ^ c = False (Note: ^ is xor operator)
  - a = 2, b || c = False, (!b) ^ c = True
  - a = 3

Which one of the following statements is CORRECT?

Select one:

- a. The minimum number of statement-complete test cases is 4.
- b. The minimum number of branch-complete test cases is 5.
- c. The maximum number of path-complete test cases is 10.
- d. The minimum number of path-complete test cases is 7. 8 or 9 (if consider when a > 3)   ✗
- e. None of the statements.

True — System.out.println("111");

b && (!c)

a = 1   False

a = 2   True

b || c — System.out.println("110");

False

a = 3

True

(!b) ^ c — System.out.println("100");

a > 3

False

Which one the of following statements is INCORRECT?

Select one:

○ a.   Integrated Development Environments (IDEs) aim to support developers during software construction. IDEs usually come with features such as code editor, debugging tool, code completion, and version control system integration.

○ b.   None of these statements.

◉ c.   White-box tests are not as important as black-box tests since white-box tests do not verify the functional requirements of ✔ the software.

○ d.   Validation certifies that the system meets the requirements.

○ e.   Verification certifies the functional correctness of implementation.

Question **12**

Correct

Marked out of 1.00

Consider a count-min sketch with 3 x 4 counters and three hash functions, such that

h_1("a") = 3, h_2("a") = 2, h_3("a") = 3

h_1("b") = 1, h_2("b") = 1, h_3(b") = 3

h_1("c") = 3, h_2("c") = 2, h_3("c") = 2

h_1("d") = 1, h_2("d") = 1, h_3("d") = 4

Consider the sequence of items to be added to the count-min sketch: "b", "c", "a", "d", "a", "d", "c", "d"

Which one of the following statements is CORRECT?

Select one:

○ a.   The number occurrences of "b" returned by the count-min sketch is 4.

○ b.   The number occurrences of "c" returned by the count-min sketch is 3.

◉ c.   The number occurrences of "d" returned by the count-min sketch is 3.   ✔

○ d.   None of these statements.

○ e.   The number occurrences of "a" returned by the count-min sketch is 4.

Marked out of 1.00

If you insert the following keys to an empty AVL tree: 23, 1, 2, 25, 24, 20

Which of the following is the root of the final tree?

Select one:

- a. 2
- b. 1
- ⦿ c. 23   ✔
- d. 24
- e. 20
- f. 25

Question **14**

Correct

Marked out of 1.00

What is the running time of the following method? Assume that method c() requires a constant number of operations.

```
public void method(int n) {
      c();
      for (int j = 0; j < n; j++) {
            c();
      }
      c();
}
```

Select one:

- ⦿ a. $O(n^2)$ ✔
- b. $\Omega(n^{1.1})$
- c. None of these claims is true.
- d. $O(\log n)$
- e. $\Theta(n \log n)$

Consider the recurrence equation:

$$F_n = F_{n-1} + 2F_{n-2} - F_{n-3}, F_1 = F_2 = F_3 = 1$$

If you use dynamic programming with memorization, what will be the running time?

Select one:

- a. $\Theta(n)$
- b. $O(\log n)$ ✖
- c. None of these claims is true.
- d. $\Omega(n^3)$
- e. $\Omega(n^2)$

Marked out of 1.00

The following unit test will fail on which assert command?

```
@Test
public void junitTest() {
        String s = "www";
        String s2 =  new String("www");
        String s3 = "aaa";

        assertEquals("www", s);
        assertNotEquals(s3, s);
        assertFalse(s == s2);
        assertSame(s, s2);
        assertEquals(s, s2);
        assertTrue(s != s2);
}
```

Select one:

○ a. assertFalse(s == s2)

○ b. assertEquals(s, s2)

○ c. assertNotEquals(s3, s)

○ d. assertTrue(s != s2)

◉ e. None of the mentioned assert commands ✔

Marked out of 1.00

You build a binary search tree in this order:

Firstly, adding 30, 15, 27, 40, 45, 33, 44

Next, deleting 45, 30, 15

Lastly, adding 19, 31, 20

If you walk in the final tree using the post-order approach, what will be the CORRECT output?

Select one:

- a. 20, 19, 33, 31, 44, 40, 27
- b. 20, 19, 44, 40, 31, 33, 27
- ◉ c. 20, 19, 31, 27, 44, 40, 33 ✔
- d. 20, 19, 33, 27, 44, 40, 31
- e. None of these outputs.

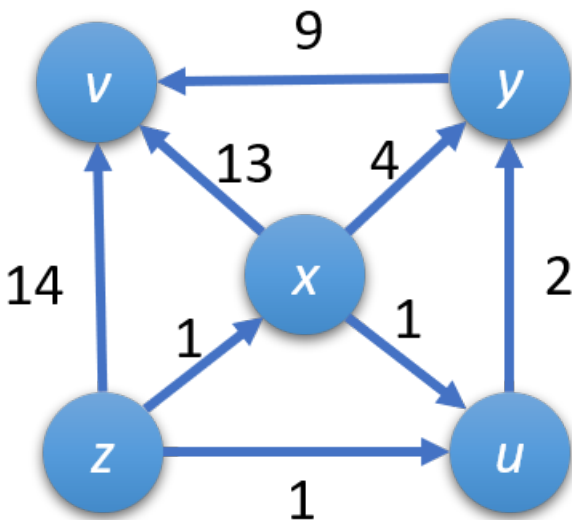
Question **18**

Correct

Marked out of 1.00

Consider the directed graph with the edge costs in the figure.

If you compute the shortest paths to v by dynamic programming, what will be the minimum costs at k = 3th round?

Select one:

- ◉ a. $\delta_k(v, v) = 0, \delta_k(x, v) = 12, \delta_k(y, v) = 9, \delta_k(z, v) = 12, \delta_k(u, v) = 11$. ✔
- b. None of these values.
- c. $\delta_k(v, v) = 0, \delta_k(x, v) = 13, \delta_k(y, v) = 9, \delta_k(z, v) = 14, \delta_k(u, v) = \infty$.
- d. $\delta_k(v, v) = 0, \delta_k(x, v) = 13, \delta_k(y, v) = 9, \delta_k(z, v) = 14, \delta_k(u, v) = 11$.
- e. $\delta_k(v, v) = 0, \delta_k(x, v) = 13, \delta_k(y, v) = 9, \delta_k(z, v) = 12, \delta_k(u, v) = 11$.

Marked out of 1.00

Consider a Bloom filter with 6 bits, and three hash functions: h_1, h_2, h_3.

Then we add three words ("apple", "orange", "banana") to the Bloom filter, with the following hash function values:

h_1("apple") = 3, h_2("apple") = 2, h_3("apple") = 3

h_1("orange") = 1, h_2("orange") = 2, h_3("orange") = 4

h_1("banana") = 1, h_2("banana") = 6, h_3("banana") = 1

Which one of the following statements is CORRECT?

Select one:

- a. If h_1("cherry") = 1, h_2("cherry") = 2, h_3("cherry") = 3, then "cherry" is not found in the resultant Bloom filter.

- b. The resultant Bloom filter is "110011".

- c. If h_1("peach") = 1, h_2("peach") = 6, h_3("peach") = 5, then "peach" is not found in the resultant Bloom filter. ✔

- d. The resultant Bloom filter is "110111".

- e. None of these statements.

Question **20**

Incorrect

Marked out of 1.00

Consider a hashtable with hash function $h(k) = k \mod 57$.

Which one of the following statements is CORRECT?

Select one:

- a. No collision occurs when inserting keys 3578, 7568, 1445, 575.

- b. None of these statements.

- c. Collision occurs when inserting keys 345, 7568, 885, 575. ✘

- d. Collision occurs when inserting keys 345, 2345, 575, 233.

- e. No collision occurs when inserting keys 1445, 230, 885, 7568.

◄ Past Exam Questions

Jump to...

Programming Questions (65%) ►