

Sample Exam 2 - Chao

Construction

1. Create a test suite that will test every branch of the `calculate()` method in the following `Utility` class. Note: Do not use JUnit. Just list the value of `x` and `y` and the expected return value for each test case. Hint: Recall that we distinguished between *branch coverage*, *condition coverage* and *multiple condition coverage*. This question is about branch coverage.

```
1. public class Utility
```

```
2.     {
3.         public static int calculate(int
4.             x, int y)
5.         {
6.             int         a, b;
7.             do
8.             {
9.                 a = 1;                // S1
10.
11.                 if (x > y)            // S2
12.                 {
13.                     a = 2;            // S3
14.                 }
15.
```

```

16.          x++;                                // S4
17.          b = x * a;                          // S5
18.          }
19.          while (b <= 0);                       // S6
20.
21.          return b;                             // S7
22.      }
23.  }

```

2. Suppose S2 above was changed to `if ((x > y) && (x < 100))`, how many branches would need to be covered (for 100% branch coverage)?
3. How many branches would need to be covered (for 100% branch coverage) in the following statement: `if ((i < 0) || (i > 10))`?
4. How many **conditions** would need to be covered (for 100% condition coverage) in the following statement: `if ((i < 0) || (i > 10))`? Hint: This question is about what we call condition coverage (i.e., what EcEmma/JaCoCo mistakenly calls branch coverage).
5. Briefly, but carefully, define each of the following terms:

Debugging

Regression Testing

Static Analysis

Test Case (or Test Point)

Trigger Condition

6. Compare and contrast two different kinds of code review.
7. Define the term "Test Driven Development".
8. List three different kinds of conventions that are often included in style guides.

9. Order the following debugging actions (which are currently in alphabetical order) based on when they would be performed in the normal work cycle. You may use an action more than once.
- Correction
 - Globalization
 - Localization
 - Stabilization
 - Verification
10. Carefully explain how tools can be used to make alpha testing more efficient. You must think about the problem both from the perspective of the tester and the programmer.

Deployment, Support, and Maintenance

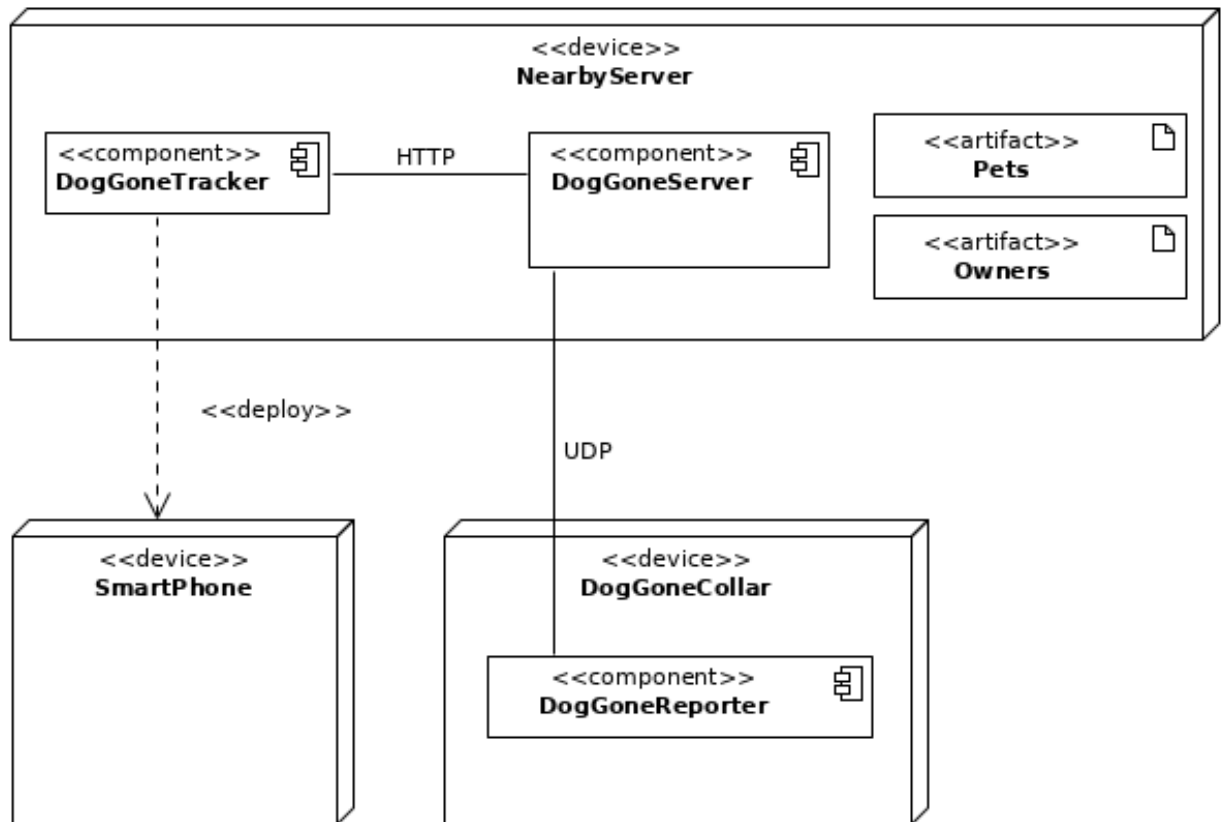
11. Briefly, but carefully, define each of the following terms:

Preventive Maintenance

Response Time (as it is used in Maintenance)

Physical Architecture

12. Carefully explain the difference between the following two physical architectures: mainframe and cloud.
13. The following UML Deployment Diagram describes the way in which the (fictitious) company Nearby deploys their product named *DogGone*, a GPS-equipped dog collar monitoring system.



- a. Is the DogGoneTracker "permanently" installed on the user's smartphone or is it installed each time it is used?
 - b. Is the DogGoneReporter "permanently" installed on the DogGoneCollar or is it installed each time it is used?
 - c. What maintenance issues arise as a result of your answers to the previous two questions?
 - d. On which device is the correspondence between pets and owners determined.
 - e. How much data bandwidth (in a qualitative sense) is required by this deployment? Explain.
14. Explain the difference between synchronous support and asynchronous support. Which is provided by the JMU Help Desk?

Project Management

15. Describe two (we discussed four) different management activities. In Scrum, which participants are responsible for each of these activities?
16. The following questions are all concerned with burn-up charts.

- a. In a burn-up chart, earned value can be measured in a variety of different ways, one of which is story points. Provide a concise definition of story points.
 - b. Describe the shape of the plot of the planned value (in a burn-up chart) when story points are used.
 - c. In a burn-up chart with the business value measure in dollars on the vertical axis and the sprint number on the horizontal axis, how do you find the schedule variance measured in dollars at the end of a particular sprint?
 - d. In a burn-up chart with the business value measure in dollars on the vertical axis and the sprint number on the horizontal axis, how do you find the schedule variance measured in weeks at the end of a particular sprint?
17. Using regression analysis and industry-wide data about effort, E (measured in person-months), and output measured in thousands of lines of code, L or measured in function points, F , Basili and Freburger (1981) estimated the following relationship:

$$E = 1.38L^{0.93}$$

whereas Kemerer (1987) estimated the following relationship:

$$E = -37.0 + 0.96F$$

- a. Using the Basili and Freburger model, about how much effort is required to produce 2000 lines of code?
 - b. Current estimates are that, in languages like C++, Java and JavaScript, every function point corresponds to about 50 lines of code. Using this correspondence and the Kemerer model, about how much effort is required to produce 2000 lines of code?
18. The Harrisonburg Kennel Club has become very interested in using a customized version of *DogGone*, a GPS-equipped dog collar monitoring system, at their events starting next year (for a period of 10 years). Nearby (the company that developed *DogGone*) has told them that it will cost \$100,000 to develop the custom version (with payment required up front). Alternatively, the Harrisonburg Kennel Club can license a competitor's existing product for \$10,000 for the first 5 years and for \$15,000 for the next 5 years (with payment required at the start of each year).

Given that the Harrisonburg Kennel Club can borrow money at an interest rate of 4%, that they must enter into a 10 year contract, and that they will use the software for exactly 10 years, should they buy the system from Nearby or license the competitive product? In other words, calculate the present value of the lease and compare it to the up-front cost of the purchase. Show all of your work.

Comprehensive Questions

19. Indicate the best match for each of the following:

- | | |
|---|-----------------------------|
| _____ A visualization used for performance tracking | a. A Gantt Chart |
| _____ A visualization used for scheduling | b. A Burn-Up Chart |
| _____ A visualization of a physical architecture | c. A UML Deployment Diagram |

20. Indicate the best match for each of the following:

- | | |
|--|---------------------------------------|
| _____ Talking to a user to improve their experience | a. As Part of Project Management |
| _____ Performing unit tests | b. During Implementation/Construction |
| _____ Keeping the product usable in a changing environment | c. During Deployment |
| _____ Installing the software on the physical architecture | d. While Providing Support |
| _____ Debugging | e. During Maintenance |
| _____ Acquiring necessary resources | |

Tools

21. Indicate the best match for each of the following:

- | | |
|---------------------------------|------------------|
| _____ A testing framework | a. JUnit |
| _____ A dynamic analysis tool | b. Git |
| _____ A Java documentation tool | c. EcEmma/JaCoCo |
| _____ A static analysis tool | d. Checkstyle |
| _____ A code management tool | |