**Name:** _____

**CSE Net ID (username):** _____

_____

This exam is closed book, closed notes. You have **50 minutes** to complete it. It contains 43 questions and 8 pages (including this one), totaling 102 points.

Before you start, please check your copy to make sure it is complete. When you are finished, turn in all pages, together. **Write your initials on the top of *ALL* pages you turn in** (in case a page gets separated during test-taking or grading).

When you are asked for multiple answers, give answers that are as different as possible. Always give the most important answers.

Unless otherwise directed, answer in **one phrase** (when one answer line is given) or **one sentence** (when two or three answer lines are given).

If your answer to a T/F or multiple-choice answer is contingent on missing information, *briefly* note that. This should be very rare.

**Please write neatly**; we cannot give credit for what we cannot read.

Good luck!

# 1 True/False

**Circle the correct answer. T is true, F is false. (1 point each, 15 points total)**

1. **T / F** It can be a good practice to write tests for a different specification than that advertised to clients.

2. **T / F** Trade secrets expire after 20 years.

3. **T / F** A build system ensures that tests are run upon every push.

4. **T / F** Feature creep is when you start a project with too many features for you to feasibly implement.

For each of the following, is it a question on the Joel Test?

5. **T / F** Do you have testers?

6. **T / F** Do you write tests before you write code?

7. **T / F** Do you have an up-to-date schedule?

8. **T / F** Do you have a spec?

9. **T / F** Do you write unit tests?

10. **T / F** Do you do a build on every commit to your main branch?

11. **T / F** Can you make a build in one step?

12. **T / F** Do you fix bugs before writing new code?

13. **T / F** Do you have coding standards?

14. **T / F** Does all code go through code review?

15. **T / F** Do you use source control?

**Circle the correct answer. T is true, F is false. (1.5 points each, 12 points total)**

Consider the following class, subclass, and type hierarchies. In the type hierarchies, H is a subtype of G, I is a subtype of H, etc.

```
class C {                              G         K
  H foo(L arg) { ... }                 |         |
}                                      H         L
                                       |         |
class D extends C { ... }              I         M
```

Which of the following declarations of foo in class D satisfy behavioral subtyping?

16. **T / F**  G foo(L arg)

17. **T / F**  I foo(L arg)

18. **T / F**  H foo(K arg)

19. **T / F**  H foo(M arg)

20. **T / F**  I foo(M arg)

21. **T / F**  I foo(K arg)

22. **T / F**  G foo(M arg)

23. **T / F**  G foo(K arg)

## 2   Multiple choice

**Choose the best answer. (3 points each, 12 points total)**

24. What is the relationship between `git fetch` and `git pull`?

    (a) they do the same thing

    (b) git fetch does more

    (c) git pull does more

    (d) neither is a subset of the other

25. What's a commonly-used tool to detect array bound errors in C code?

    (a) VS Code

    (b) valgrind

    (c) gcc

    (d) gdb

    (e) clang

    (f) reiserfs

    (g) lint

    (h) heimdallr

26. What is the relationship between regression tests and unit tests?

    (a) they are different terms for the same concept

    (b) every unit test is a regression test

    (c) every regression test is a unit test

    (d) neither concept subsumes the other

27. What should be the relationship of the specification of method `Superclass.foo()` and the specification of `Subclass.foo()`, where `Subclass` is a subclass of `Superclass`?

    The specification of `Subclass.foo()` _____ the specification of `Superclass.foo()`.

    (a) is the same as

    (b) is stronger than

    (c) is stronger than or the same as

    (d) is weaker than

    (e) is weaker than or the same as

    (f) none of the above is necessary

# 3   Choose all that apply

**Mark all the correct answers, by circling the appropriate letters. (1 point per subitem, 15 points total)**

28. Which of the following is a good requirement?

    (a) The product will never crash.

    (b) The product will crash in $<0.01\%$ of sessions.

    (c) The product will be secure against hacks.

    (d) Product crashes will not impact security.

29. Which of the following is a best practice for writing project requirements?

    (a) Assign priorities.

    (b) Describe goals at a high level.

    (c) Leave UX/eng as unconstrained as possible.

    (d) Avoid rigid templates/formats.

30. Suppose you have two different programs P and Q written to the same specification, and the developers (who are competent) have created a white-box and a black-box test suite for each. Mark all of the following that are true.

    (a) The white-box test suite for P passes on Q.

    (b) The black-box test suite for P passes on Q.

    (c) The two black-box test suites are similar or identical.

    (d) The two white-box test suites are similar or identical.

31. Which of the following is a potential *downside* to a God class?

    (a) It modularizes functionality

    (b) It is difficult to test

    (c) It leads to tight coupling

# 4   Very short answer

**Answer in one word or phrase. (4 points each, 28 points total)**

32. In a successful project, which stage of the software development lifecycle contains the majority of work?

    _____

33. Please mark the following features as P0, P1, or P2 for a team making a to-do list app.

    (a) _____ Can add items to list

    (b) _____ Can prioritize different tasks

    (c) _____ Can send task notifications

    (d) _____ Can share lists

    (e) _____ Can mark items as complete

34. State a fact about connectors in a layered architecture that is not true about connectors in a pipe-and-filter architecture.

    _____

35. What two things does InterConnect connect to each other? (This is a question about the user view of the project, not its architecture or implementation.)

    _____

36. What is the biggest limitation of the beta product for FitQuest?

    _____

37. What is the only technique that is taught in the beta product for Journey of the Voice?

    _____

38. What is the most important disadvantage of a client–server architecture?

    _____

# 5   Short answer

**(4 points each, 12 points total)**

39. What is representation exposure?

_____

_____

_____


40. What are two ways that representation exposure can occur?

    (a) _____

_____

_____


    (b) _____

_____

_____


41. Define "technical debt".

_____

_____

_____

**(4 points each, 8 points total)**

42. Team A has decided to use the waterfall model as its SDLC and Team B has decided to use prototyping. Suppose that each team has chosen well. State the main difference between the *requirements* of Project A and Project B.

43. Describe the difference between a "north star" metric and a "balance" metric.