Student Name: _____ Student ID # _____

OU Academic Integrity Pledge

On my honor I affirm that I have neither given nor received inappropriate aid in the completion of this exercise.

Signature: _____ Date: _____

Notes Regarding this Examination

Open Book(s) You may consult any printed textbooks in your immediate possession during the course of this examination.

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No Electronic Devices Permitted You may not use any electronic devices during the course of this examination, including but not limited to calculators, computers, and cellular phones. All electronic devices in the student's possession must be turned off and placed out of sight (for example, in the student's own pocket or backpack) for the duration of the examination.

Violations Copying another's work, or possession of electronic computing or communication devices in the testing area, is cheating and grounds for penalties in accordance with school policies.

Part I. Recursion

1. (2 points) Which type of code is possible to convert to iterative code?
   A. Tail recursive
   B. Self recursive
   C. Mutually recursive
   D. A and B
   E. A, B, and C

2. (2 points) Which type of code is easiest to convert to iterative code?
   A. Tail recursive
   B. Self recursive
   C. Mutually recursive
   D. A and B
   E. A, B, and C

3. (2 points) Iterative code that is converted from recursive code is likely to contain which of the following (as compared to the original recursive code)?
   A. Additional local variables
   B. Additional looping structures
   C. Additional parameters
   D. A and B
   E. A, B, and C

4. (2 points) The call stack is used for which?
   A. Recursive methods
   B. Iterative methods
   C. Non-looping methods
   D. A and B
   E. A, B, and C

5. (2 points) Which of the following is not needed for recursion?
   A. A basis case
   B. A recursive case
   C. A loop counter
   D. A and B
   E. A, B, and C

6. (2 points) Which of the following is placed on a call stack?
   A. Parameters
   B. Local variables
   C. Program counters
   D. A and B
   E. A, B, and C

7. (2 points) If `method1` calls `method2` and `method2` calls `method1`, what is that called?
   A. Tail recursion
   B. Mutual recursion
   C. Iteration
   D. Encapsulation
   E. Inheritance

Exam continues in Part II.

Part II. Applications of Recursion

Consider the following code:

```java
public class Exam3a {
    private static int m (int a, int b){
        if (a <= 0)
            return b;
        else
            return m (a/2, a + b);
    }

    public static void main(String[] args) {
        int result = m (20, 0);
        System.out.println(result);
    }
}
```

8. (2 points) What type of code is shown?
    A. Iterative
    B. Recursive
    C. Tail recursive
    D. A and B
    E. A, B, and C

9. (2 points) Which is the basis case for this code?
    A. `if (a <= 0) return b;`
    B. `else return m (a/2, a + b);`
    C. `int result = m (20, 0);`
    D. `System.out.println(result);`
    E. This code has no basis case

10. (2 points) Which is the recursive case for this code?
    A. `if (a <= 0) return b;`
    B. `else return m (a/2, a + b);`
    C. `int result = m (20, 0);`
    D. `System.out.println(result);`
    E. This code has no recursive case

11. (5 points) What is the first value returned by method `m`?
    A. 20
    B. 0
    C. 10
    D. 210
    E. 38

12. (5 points) What is the value printed by this program?
    A. 20
    B. 0
    C. 10
    D. 210
    E. 38

Consider the following code:

```java
public class Exam3b {
    private static void recurse(String str1, String str2) {
        int n = str2.length();
        if (n == 0)
            System.out.println(str1);
        else {
            for (int i = 0; i < n; i++) {
                recurse(str1 + str2.charAt(i),
                        str2.substring(0, i) + str2.substring(i+1, n)↩
                        );
            }
        }
    }

    public static void main(String[] args) {
        recurse("", "E3");
    }
}
```

Note the following from the `String` API:
```
public String substring(int beginIndex, int endIndex)
```

Returns a new string that is a substring of this string. The substring begins at the specified `beginIndex` and extends to the character at index `endIndex` - 1. Thus the length of the substring is `endIndex-beginIndex`.

13. (2 points) What type of code is shown?
    A. Iterative
    B. Recursive
    C. Tail recursive
    D. A and B
    E. A, B, and C

14. (2 points) Which is the basis case for this code?
    A. `int n = str2.length();`
    B. `if (n == 0) System.out.print(str1);`
    C. `else ...  recurse ...`
    D. `recurse("", "E3");`
    E. This code has no basis case

15. (2 points) Which is the recursive case for this code?
    A. `int n = str2.length();`
    B. `if (n == 0) System.out.print(str1);`
    C. `else ...  recurse ...`
    D. `recurse("", "E3");`
    E. This code has no recursive case

16. (5 points) What is the first line printed by this program?
    A. E3
    B. 3E
    C. E
    D. E 3 E 3
    E. The empty `String`

17. (5 points) What is the second line printed by this program?
    A. E3
    B. 3E
    C. 3
    D. E 3 E 3
    E. The empty `String`

Exam continues in Part III.

Part III. Preconditions, Postconditions, Exceptions, and Assertions

18. (2 points) Which `catch` statement cannot come after `catch (IOException e)` following a single `try`?
    A. `catch (IndexOutOfBoundsException e)`
    B. `catch (FileNotFoundException e)`
    C. `catch (ArithmeticException e)`
    D. `catch (Exception e)`
    E. `catch (NumberFormatException e)`

19. (2 points) Postconditions should be deduced during which development phase?
    A. Specification
    B. Program Design
    C. Implementation
    D. Integration
    E. Maintenance

20. (2 points) The code for postconditions should be written during which development phase?
    A. Specification
    B. Program Design
    C. Implementation
    D. Integration
    E. Maintenance

21. (2 points) Postcondition code should be executed during which development phase?
    A. Specification
    B. Program Design
    C. Implementation
    D. Integration
    E. Maintenance

22. (2 points) A precondition is which of the following?
    A. A condition that must be true at all times to ensure correct behavior
    B. A condition that must be true when a method begins to ensure correct behavior
    C. A condition that must be true just before a method returns to ensure correct behavior
    D. A and B
    E. None of the above

23. (2 points) A postcondition is which of the following?
    A. A condition that must be true at all times to ensure correct behavior
    B. A condition that must be true when a method begins to ensure correct behavior
    C. A condition that must be true just before a method returns to ensure correct behavior
    D. A and B
    E. None of the above

24. (3 points) Assertions are most appropriate for testing preconditions for which methods?
    A. Private methods
    B. Public methods
    C. Abstract methods
    D. A and B
    E. None of the above

25. (3 points) Conditions with exceptions are most appropriate for testing preconditions for which methods?

    A. Private methods
    B. Public methods
    C. Abstract methods
    D. A and B
    E. None of the above

26. (3 points) Assertions are most appropriate for testing postconditions for which methods?

    A. Private methods
    B. Public methods
    C. Abstract methods
    D. A and B
    E. None of the above

27. (3 points) Conditions with exceptions are most appropriate for testing postconditions for which methods?

    A. Private methods
    B. Public methods
    C. Abstract methods
    D. A and B
    E. None of the above

28. (3 points) Which would be the most appropriate precondition for a factorial function?

    A. $n \geq 0$
    B. $n == 0$
    C. factorial(n) = n * factorial(n-1)
    D. A and B
    E. None of the above

29. (3 points) Which would be the most appropriate postcondition for a factorial function?

    A. $n \geq 0$
    B. $n == 0$
    C. factorial(n) = n * factorial(n-1)
    D. A and B
    E. None of the above

Exam continues in Part IV.

Part IV. Ethics

Situation (hypothetical).

All of your answers in this part should be based on the scenario below.

Lawrence is way too busy. He's a full-time CS student taking 18 credit hours, he's working part time at a pizza place to help pay for school, and over the summer he started a software company with Claudia. It is really more than he can handle.

Still, he's trying to hang in there. He's cut way back on fun times and socializing. During slow times at work, he grabs his laptop and reads or codes for his classes or his company. And, of course, Google is his friend. When he doesn't know how to code something, he has found that a quick search with a good choice of keywords is likely to turn up something quite relevant that he can copy, paste, and edit into what he needs. Hey, if someone puts it out there, it is fair game, right?

Still, he's falling behind more and more by the day and often feels that he should just come clean with Claudia and tell her that he can't manage everything and that she should look for a new partner. At least that would be one less thing he needs to worry about.

30. (3 points) Of the following ethical principals from the IEEE Code of Ethics, which has Lawrence most likely violated in this scenario?

A. "to accept responsibility in making decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment"
B. "to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist"
C. "to reject bribery in all its forms"
D. "to improve the understanding of technology; its appropriate application, and potential consequences"
E. "to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others"

31. (3 points) Of the following ethical principals from the ACM Code of Ethics, which has Lawrence most likely violated in this scenario?

A. "Contribute to society and human well-being"
B. "Be fair and take action not to discriminate"
C. "Honor property rights including copyrights and patent"
D. "Respect the privacy of others"
E. "Honor confidentiality"

32. (3 points) Of the following ethical principals from the ACM Code of Ethics, which has Lawrence most likely violated in this scenario?

A. "Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work"
B. "Acquire and maintain professional competence"
C. "Know and respect existing laws pertaining to professional work"
D. "Accept and provide appropriate professional review"
E. "Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks"

33. (3 points) Of the following ethical principals from the joint ACM/IEEE Software Engineering Code of Ethics, which has Lawrence most likely violated in this scenario?

    A. "Software engineers shall act consistently with the public interest"
    B. "Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest"
    C. "Software engineers shall ensure that their products and related modifications meet the highest professional standards possible"
    D. "Software engineers shall maintain integrity and independence in their professional judgment"
    E. "Software engineers shall be fair to and supportive of their colleagues"

34. (3 points) Which of the following is a likely motivation for Lawrence's violation of one of the ethical principals above?

    A. Lawrence is angry about his poor job prospects after graduation
    B. Lawrence doesn't like Claudia
    C. Lawrence enjoys his job at the pizza place
    D. Lawrence is feeling rushed and stressed
    E. Lawrence is embarrassed by his poor coding skills

35. (3 points) Which of the following is a likely reason for Lawrence's violation of one of the ethical principals above?

    A. Lawrence is unfamiliar with relevant laws
    B. Lawrence doesn't think privacy is important
    C. Lawrence likes Claudia
    D. Lawrence has one less thing to worry about
    E. Lawrence wants to start a new company

36. (3 points) Which of the following is an ethical-decision-making problem (interfering factor) that is likely to have contributed to at least one of Lawrences decisions?

    A. He chose the rule/principle that promotes himself rather than thinking about the needs and concerns of others
    B. He was unaware of his own biases
    C. He thought he knew all the answers and was hesitant to ask for help from a respected outside source who has dealt with a similar dilemma
    D. He failed to identify hidden motives or agendas of involved parties and their decisions' implications for each of these parties
    E. He failed to evaluate how his decisions would be viewed by respected professionals (experts)

37. (3 points) Which of the following is an ethical-decision-making strategy that Lawrence could employ to improve her or his ethical decision making?

    A. He should have only copied code that was listed as freely available
    B. He should have added comments to his code to mark where the other code came from
    C. He should have taken out a loan instead of working so that he wouldn't be so busy
    D. He shouldn't have formed the company with Claudia last summer
    E. He should have asked people he trusted for their opinions on his actions

Bonus questions for Exam 2 are in Part V.

Part V. EXAM 2 BONUS QUESTIONS

Answering the following questions correctly will add the listed number of points to your Exam 2 score. They will not change your Exam 3 (Final Exam) score nor will answering them incorrectly reduce your Exam 2 score.

38. (2 points) The default behavior of a `JScrollPane` includes which of the following?
    A. Clicking on a scroll bar allows the user to scroll up or down through the displayed content
    B. A scroll bar appears if and only if there is more content than can be displayed in the window
    C. Both vertical and horizontal scrolling is possible
    D. A and B
    E. A, B, and C

39. (3 points) Which of the following is a disadvantage of `FlowLayout` as compared to `GridLayout`?
    A. `FlowLayout` presents the items in the order they were added
    B. In `FlowLayout`, items may jump up or down rows as the window is resized
    C. `FlowLayout` is not the default layout manager so it needs to be created and assigned
    D. A and B
    E. A, B, and C

40. (2 points) A `JList` is most likely to be created by which of the following?
    A. A Model
    B. A View
    C. A Controller
    D. A Driver
    E. None of the above

41. (3 points) Which of the following is most likely to be a listener on a timer?
    A. A Model
    B. A View
    C. A Controller
    D. A Driver
    E. None of the above

Bonus questions for Exam 1 are in Part VI.

Part VI. EXAM 1 BONUS QUESTIONS

Answering the following questions correctly will add the listed number of points to your Exam 1 score. They will not change your Exam 3 (Final Exam) score nor will answering them incorrectly reduce your Exam 1 score.

42. (2 points) Which of the following is not an example of polymorphism?
    A. Overloading
    B. Overriding
    C. Subclass assignment
    D. Dynamic method binding
    E. None of the above

43. (3 points) Encapsulation is intended to help with which of the following objectives?
    A. Promoting code reuse
    B. Ensuring code correctness
    C. Reducing code maintenance costs
    D. A and B
    E. A, B, and C

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[1]Except for the statement that this page was intentionally left blank. And this footnote. And the headers. But, other than that, blank. Intentionally so.