Informatics 43 – Introduction to Software Engineering
Final Exam – Spring, 2015

Write your name in B L O C K C A P I T A L L E T T E R S.

First Name: _____ Last Name: _____

Student ID: _____

1-20	α	β + γ	Total

Record your answers to questions 1 through 20 below by circling the letter of your response.

1.   a   b   c   d   e

2.   a   b   c   d   e

3.   a   b   c   d   e

4.   a   b   c   d   e

5.   a   b   c   d   e

6.   a   b   c   d   e

7.   a   b   c   d   e

8.   a   b   c   d   e

9.   a   b   c   d   e

10. a   b   c   d   e

11. a   b   c   d   e

12. a   b   c   d   e

13. a   b   c   d   e

14. a   b   c   d   e

15. a   b   c   d   e

16. a   b   c   d   e

17. a   b   c   d   e

18. a   b   c   d   e

19. a   b   c   d   e

20. a   b   c   d   e

Multiple choice questions are worth three points each.

Match each author with the appropriate quotation.

Author(s)	Quotation
1. Frederick Brooks	A. "Individuals and interactions over processes and tools"
2. Edsger Dijkstra	B. "The multi-person development of multi-version programs."
3. Clay Shirky	C. "Testing can show the presence of bugs, but not their absence."
4. The authors of the Agile Manifesto	D. "Adding manpower to a late software project makes it later."
5. David Parnas and Brian Randell	E. "A screen that ships without a mouse ships broken. Media that's targeted at you but doesn't include you may not be worth sitting still for."

6. Suppose a software designer carefully reviews a project's design (consisting of written text, UML diagrams, and sketches) to make sure that it completely matches the Requirements Specification, with nothing modified or omitted. A word to describe this task is
    a. Validation
    b. Testing
    c. Modeling
    d. Verification
    e. Prototyping

7. The Quality Assurance goal of static analysis is to
    a. improve run-time
    b. find defects
    c. count KLOC
    d. provide black-box test cases
    e. prove program correctness

8. The following formula was presented in the lecture on project effort estimation: $E=0.7 \text{ KLOC}^{1.50}$. In this formula, what does "E" mean?
   a. effort
   b. ease
   c. entropy
   d. elephant
   e. estimate

Match each architectural style with the most suitable characteristic.

Architectural Style	Characteristics
9. Client-server	A. The components can be utilized in any order, since they all share a common input and output format.
10. Layered	B. Good for a system that reacts to user actions such as key presses, and to other external actions.
11. Model View Controller	C. Enforces a separation between the presentation of information and the storage and processing of information; especially useful when information will be displayed in different ways.
12. Pipes and filters	D. A provider of a resource and a requestor of the resource communicate over a network.
13. Event-driven	E. Components in one group are independent of each other; they make procedure calls to components in the group below.

14. Clay Shirky was asked, "Where do they find the time?" What was his answer?
    a. They use some of the cognitive surplus.
    b. They stop editing Wikipedia.
    c. They look behind the television for the mouse.
    d. They adopt open source software.
    e. They no longer drink gin or watch sitcoms.

15. The goal of regression testing is
    a. to regress the software to a previous state.
    b. to ensure thoroughness in white box testing.
    c. to make sure a new feature or bug fix has not broken existing code.
    d. to make sure the code is readable.
    e. to verify the user-friendliness of new software.

16. The purpose of an oracle in testing is
    a. to provide a database of test cases.
    b. to determine whether a test case execution succeeded or failed.
    c. to replace formal specifications.
    d. to determine when testing can be stopped.
    e. to help identify the set of all possible inputs.

17. In which quadrant of the spiral model does testing take place?
    a. upper left
    b. upper right
    c. lower left
    d. lower right
    e. in all quadrants

18. John Carmack, the co-founder of Id Software and a renown game programmer, says
    that a certain technique has changed his "mindset about the way I view software
    reliability and code quality." What is this technique?
    a. client server architecture
    b. static analysis
    c. black box testing
    d. the waterfall model
    e. Brooks' Law

19. Which of the following is not one of the inherent properties of software identified by
    Brooks in No Silver Bullet?
    a. complexity
    b. conformity
    c. changeability
    d. invisibility
    e. adaptability

20. Which of the following is one of the top three failure factors for software projects,
    according to the Chaos Report cited in the textbook?
    a. Overzealous prototyping.
    b. Incomplete requirements and specifications.
    c. The invisibility of software and elephants.
    d. Insufficiently trained programmers.
    e. A false assumption that each task will take only as long as it ought to take.

α. (20 points) You have been assigned to write test cases for black box testing of a software function called DateDiff. Here is part of DateDiff's documentation:

> DateDiff runs on a Windows PC or a Mac. The user selects two dates using drop-down lists; all dates between Jan. 1, 1900 and Dec. 31, 2050 are supported. DateDiff displays the number of days between the two dates. For instance, the difference between May 31, 2015 and June 2, 2015 is 2.

(a) What is the input domain (the set of all possible inputs) of DateDiff?

(b) What is a basis for dividing the input domain you described into subdomains?

(c) Using the basis defined in (b), specify 3 or 4 subdomains.

(d) For each subdomain from (c), give a test case input and the expected output.

β. (15 points) You've been assigned to design a software system that keeps track of students, the courses they have taken, and the majors they are pursuing. Draw a UML Class Diagram to start the design. Your diagram should have <u>exactly three boxes</u>. Your approach / level of detail can be "analysis" or "design" or "conceptual". Show at least one attribute and one operation for each class. Include in your diagram two or three relationships with names and multiplicities.

γ. (5 points) What is refactoring? What role does it play in Extreme Programming?