Answer all questions in the space following each question.

1. [10] What is:
   (a) White box testing
   (b) Black box testing
   (c) Regression testing
   (d) Partition testing
   (e) Stress testing

2. [5] Which of the following is not an estimator of project effort and why and what does it measure?
   (a) COCOMO
   (b) Function points
   (c) Cyclomatic complexity
   (d) Work breakdown structure
   (b) One of the above is based upon a formal definition. Which one and what is it?

3. [10] (a) A risk requires what two attributes in order to be considered a risk?
   (b) Explain the statement “The only absolutely safe car is one, which cannot move.”
   (c) Congress often passes unrealistic laws. Assuming current cars have a safety factor of 0.999, what would be some problems with a law that required a car to be 0.999999 safe?

4. [5] A version control system often keeps a version of a module and the set of changes between one version and the next version. Would a version control system keep the first version and the set of changes to successive versions or the last version and successive changes from the previous version? Why choose one approach over the other?
5. [10] Consider the axioms:
\[
\begin{align*}
\text{add}(0,x) &= x \\
\text{add}(\text{succ}(x),y) &= \text{succ}(\text{add}(x,y))
\end{align*}
\]
(a) Prove \(1+1=2\)

(b) If you add the axiom \(\text{add}(x,y)=x\) what happens? Is \(1+1\) still equal to 2? What does this mean?

6. [10] What are the following:
(a) Precondition

(b) Postcondition

(c) Invariant

(d) Is Z a functional or non-functional language and why?

(e) In which lifecycle phase is a Z artifact created?

7. [5] Assume 10 defects are inserted into a program. After a week of debugging, 4 of those defects are found, as well as 12 others. If the 6 inserted defects that were not found are also removed, how many defects are likely to remain in the program?

(b) What testing technique is this known as?

8. [15] Give a message sequence chart for the process of buying candy from a vending machine that accepts coins and bills. Describe as many aspects of the design as you think necessary.
9. [5] Dependability is usually defined in terms of the RMA attributes.
   (a) What are the RMA attributes?
   
   (b) Give another attribute and explain why it is a dependability attribute.

    
    (b) How can a solid concrete life preserve be ISO 9001 certified?

11. [5] (a) Can a spiral model development be used in an “agile” development project? Explain.
    
    (b) Give some of the errors made in the Ariane 5 disaster, and how would good software engineering principles have found those before launch.

12. [10] Answer each of the following:
    (a) Why is it difficult to use a strict waterfall development if you are using COTS components?
    
    (b) Give some of the errors made in the Ariane 5 disaster, and how would good software engineering principles have found those before launch.
    
    (c) What is n-version programming and why is not very effective?
13. [5] What is each of the following and what is its role in a project life cycle:

(a) Milestone

(b) Use case

(c) Sprint

(d) User story

(e) Metaphor