COMP 4081

Exam 2

Fall 2018

Name: Solutions , _____

Last name First name

Rules:

- No potty breaks.
- Turn off cell phones/devices.
- Closed book, closed note, closed neighbor.

- WEIRD! Do not write on the backs of pages. If you need more pages, ask me for some.

Reminders:

- Verify that you have all pages.
- Don't forget to write your name.
- Read each question carefully.
- Don't forget to answer every question.

1. [2pts] Which of the following is meant by a software development process?

   a) A running instance of a program; for example, a UNIX process is a software development process

   b) Something developers do to accomplish a goal during a project; for example, planning poker is a software development process for estimation

   c) Something developers use to accomplish a goal during a project; for example, Git or Subversion is a software development process for configuration management

   (d) An organization or structure imposed on the tasks and activities involved in developing a software product; for example, developing iteratively and incorporating best practices might be ingredients in a software development process

   e) None of the above

2. [2pts] What problem does iterative development directly address?

   Unstable / changing requirements

3. [2pts] Following a _____ software engineering process tends to reveal defects late in development.

   (a) Waterfall

   b) Iterative

   c) Agile

   d) All of the above

   e) None of the above

4. [2pts] In software engineering, defects that are discovered _____ are _____ to fix.

   a) by customers; less expensive

   b) by developers; more expensive

   c) earlier; more expensive

   (d) later; more expensive

   e) None of the above

5. [2pts] In iterative development, how long should an iteration generally be?

   a) 1 week

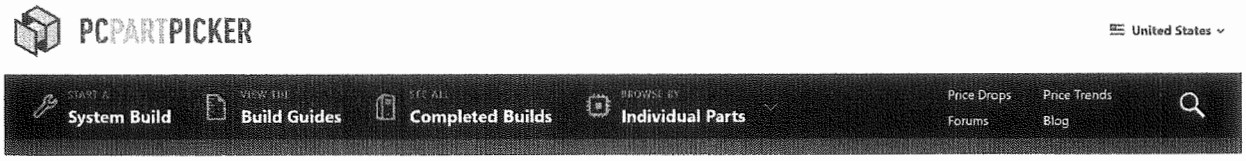
   (b) 2–6 weeks

   c) 2–4 months

   d) 6 months to a year

   e) None of the above

Consider the following webpage snippet:



6. [5pts] Reverse engineer one user story that records a requirement of your choice for the above website functionality. You must apply the templates described in class, and your US must have the other attributes of good user stories, which we discussed in class. (Please omit the US's estimate and priority.)

Many possible answers. Here's the template:

Title: <verb><noun>

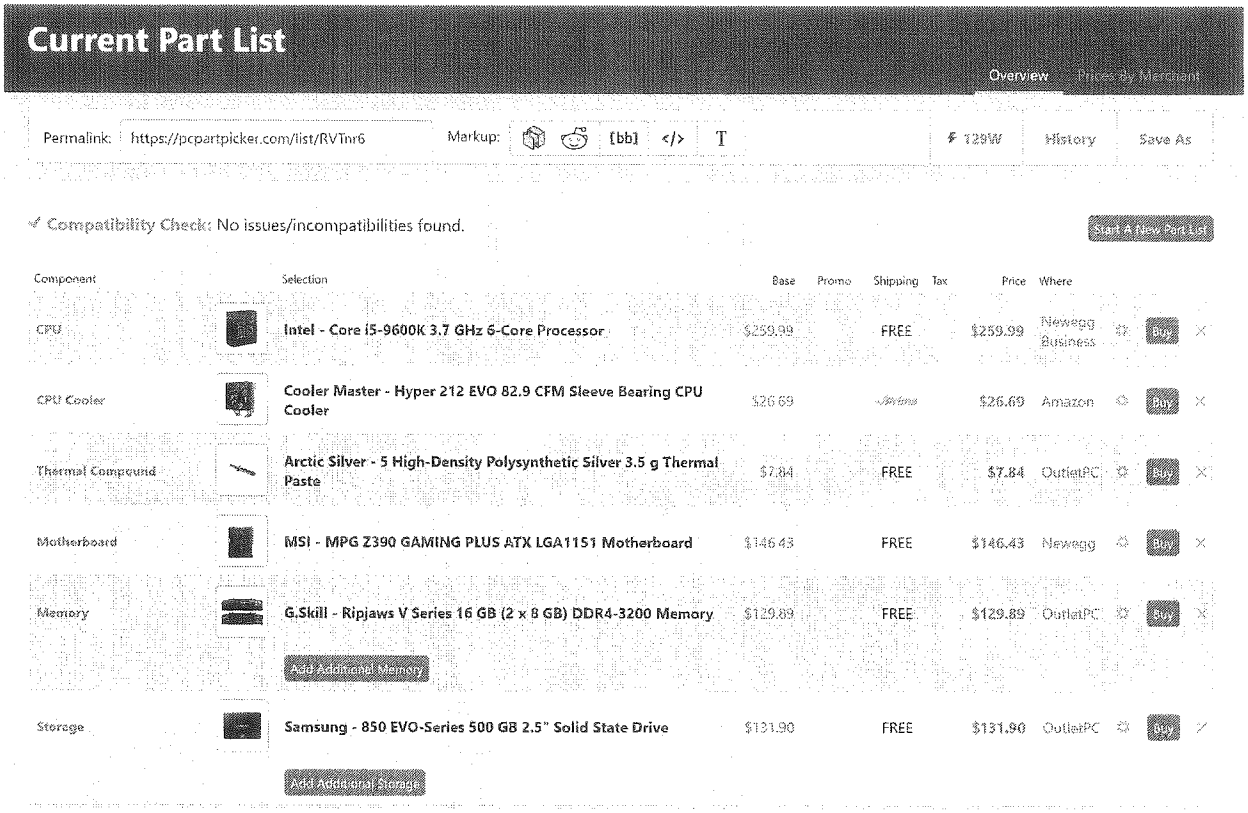
Description: As a <who>, I want to <what>, so that <why>.

Here's an example solution:

Title: Create System Build

Description: As a customer, I want to create a custom system build, so that I can get the specifications I want.

Consider this PcPartPicker interface for adding parts to a custom build:



Here is a user story related to the above interface:

Title: Remove Chosen Part Button

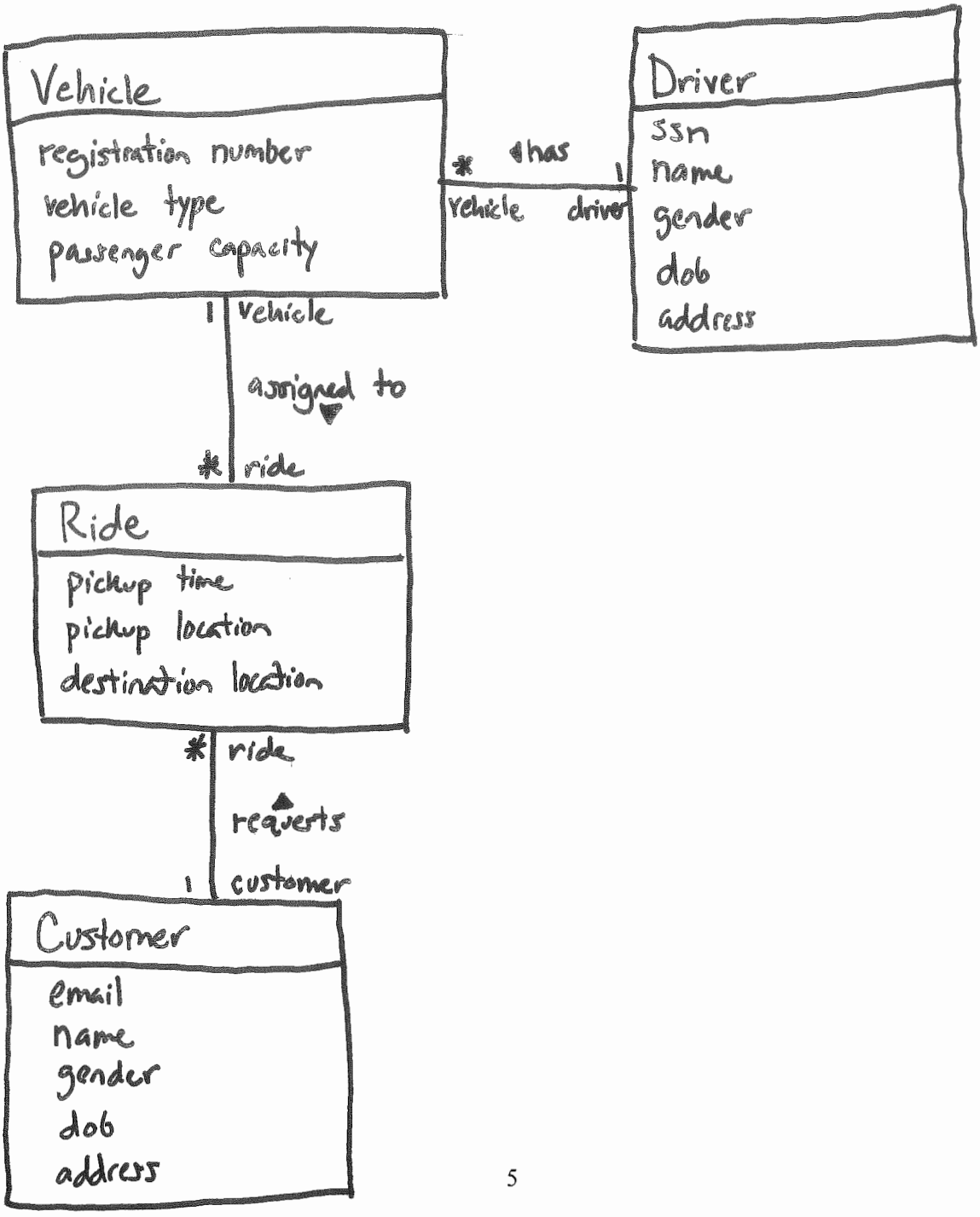
Description: The Current Part List page should have an "x" button to the right of the "Buy" button in the html container for chosen part. The on-click event for this button should invoke a jQuery action which would remove that part from the user's build.

7. [5pts] Describe two things that make this a poor-quality user story.

Three possible things (only two needed):
(1) Mentions UI design elements (buttons and button placement)
(2) Uses technical jargon (HTML container, on-click event)
(3) Mentions implementation technologies (jQuery)

8. [10pts] Create a <u>domain model</u> (using class diagram notation) based on the following description. Model only things that are specifically described. Include all conceptual classes, attributes, associations, and generalization relationships mentioned. Label all associations and association ends and include all multiplicities. Do not explicitly model the "system".

You have been asked to build a taxicab system like Uber. A driver can register one or more of their vehicles with the system. Vehicles will have a registration number, a type (sedan, SUV, van) and a passenger capacity. A driver has some personal information including their SSN, name, gender, date of birth, and address. Potential customers will be able to sign up with the system by submitting their email and some personal information, including name, gender, date of birth, and address. Once registered, customers will be able to request a ride with a specific vehicle. The customer will need to specify the time and location (as address) of pickup and the destination location address.



9. [2pts] T or F? In general, the smaller the estimate, the less likely it is to be accurate.

   a) True

   (b) False

10. [2pts] Which of the following approaches/techniques to the estimation of user story implementation time leverages the collective opinion of a group of individuals rather than that of a single expert? Circle all answers that apply.

   a) Black-box testing

   (b) Planning Poker

   c) Writing user stories

   (d) Wisdom of the Crowd

   e) None of the above

11. [2pts] In the agile development process taught in class, the _____ estimate each user story, the _____ decide the priority for each story, and the _____ choose which user stories to implement in the next iteration.

   a) developers; customers; customers

   b) customers; developers; customers

   c) customers; customers; developers

   d) customers; developers; developers

   (e) developers; customers; developers

12. [2pts] Exhaustive testing is _____ and, in general, is _____ performed in practice.

   a) a black-box technique; often

   b) a white-box technique; never

   c) writing a test for every possible output; often

   (d) writing a test for every possible input; never

   e) writing a test for every user story; often

13. [2pts] Which of the following correspond to *White-Box* testing? Circle <u>all</u> answers that apply.

a) Tests focus on boundary cases

b) Tests based only on the interface of a component

c) Tests based on the implementation of a component

d) Tests aim to achieve particular levels of code-coverage

e) None of the above (i.e., all are not true of *White-Box* testing)

14. [2pts] Which of the following correspond to *Unit* tests?

a) Tests something less than the whole system

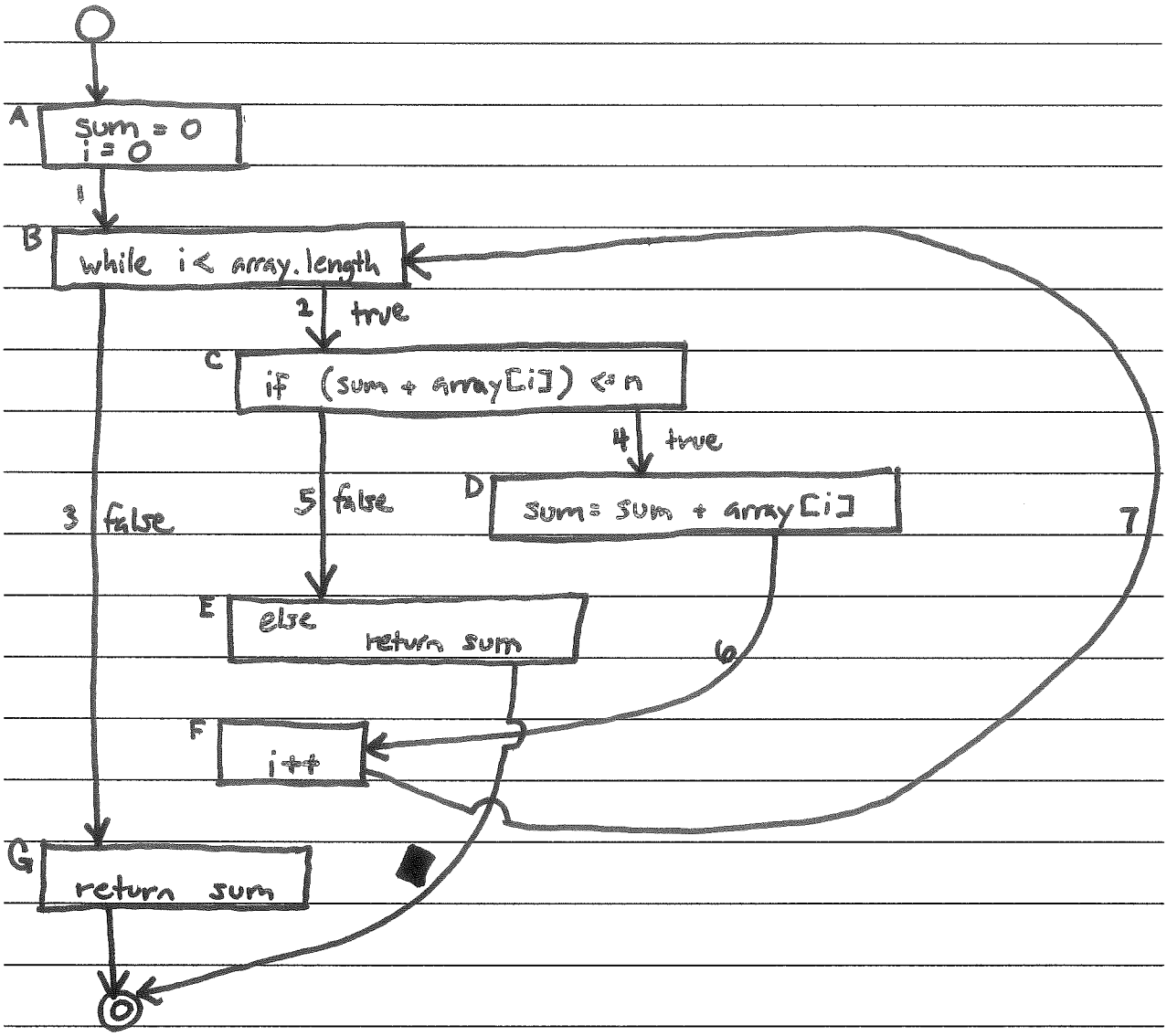
b) Should not have non-determinism

c) Should be fast (less than half a second)

d) All of the above

e) None of the above

15. [4pts] Draw a control-flow graph (CFG) for the function in Figure 1. In addition to the usual CFG features, label the nodes with capital letters (A, B, C, etc.), and label the edges with numbers (1, 2, 3, etc.). Don't forget to include entry and exit points.



Use the CFG you created for the function in Figure 1 to answer the following questions.

16. [3pts] Fill in the table below with a test suite that provides statement coverage. In the Covers column, list the letter labels (A, B, C, etc.) of the nodes covered by each test case.

Input		Expected Output	Covers
array	n		
[1]	2	1	A, B, C, D, F, G
[2]	1	0	A, B, C, E

17. [3pts] Fill in the table below with a test suite that provides branch coverage. In the Covers column, list the number labels (1, 2, 3, etc.) of the edges covered by each test case (only true/false edges needed).

Input		Expected Output	Covers
array	n		
[1]	2	1	2, 3, 4
[2]	1	0	2, 5

18. [4pts] Fill in the table below with a test suite that provides path coverage. Before you fill in the table, first list all the paths to be covered, and label each path ("P1", "P2", "P3", etc.). You need only cover executions that involve at most 1 iteration of each loop (if there are any). In the Covers column, list the path labels covered by each test case.

Paths:

P1: 1, 3

P2: 1, 2, 5

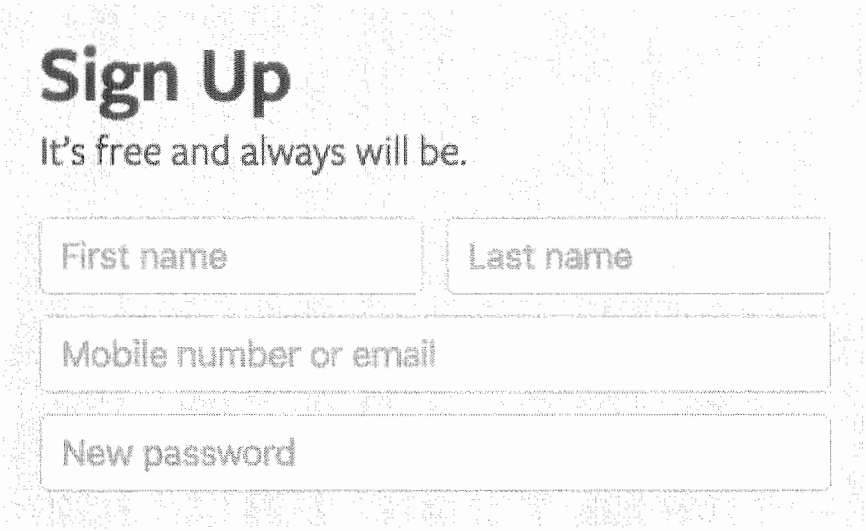
P3: 1, 2, 4, 6, 7, 3

Input		Expected Output	Covers
array	n		
[]	1	0	P1
[2]	1	0	P2
[1]	2	1	P3

19. [2pts] Imagine if the line "`i++`" was accidentally deleted from the function in Figure 1. Which, if any, of your above three test suites would catch this bug?

All three test suites would have caught this error

Consider the Facebook sign-up form:



20. [2pts] Which of the following attacks might someone attempt to perpetrate by entering malicious data and submitting the sign-up form? Circle <u>all</u> that apply.

    a) Packet sniffing

    (b) Cross-site scripting

    c) Eavesdropping

    d) Man-in-the-middle attack

    (e) SQL injection

21. [2pts] How do you prevent the above attack(s)? Circle <u>all</u> that apply.

    (a) Sanitize inputs

    b) Redirect requests

    (c) Escape input characters

    d) Disable cookies

    e) Authenticate users

22. [2pts] What kinds of attacks can be prevented using encryption? Circle <u>all</u> that apply.

a) Packet sniffing

b) Cross-site scripting

c) Eavesdropping

d) Man-in-the-middle attack

e) SQL injection

23. [2pts] Which of the following best defines design pattern?

a) A domain model class diagram

b) A reusable library API

c) A template solution to a common design problem

d) A software development process

e) None of the above

24. [2pts] Which book popularized design patterns for software engineering?

a) The "POSA" book, *Pattern Oriented Software Architecture*

b) *Head First Design Patterns*

c) *Design Patterns in Modern C++*

d) The "Gang of Four" book, *Design Patterns: Elements of Reusable Object-Oriented Software*

e) None of the above

25. [2pts] In which of the following situations would the Observer pattern be useful?

a) Your company already implemented a component that almost implements the interface that you need, but not quite

b) Your Pac-Man program needs to listen for presses of the arrow keys and to update Pac-Man's position in the maze accordingly

c) Your program must support switching among several different email libraries, but each one has a slightly different interface

d) Your application needs to generate HTML files (from scratch)

e) None of the above

Figures

```
def sum_elements_while_sum_lt_n(array, n)
  sum = 0
  i = 0
  while i < array.length
    if (sum + array[i]) <= n
      sum = sum + array[i]
    else
      return sum
    end
    i++
  end
  return sum
end
```

Figure 1. Function that sums elements of `array` in order without skipping any until the sum would become greater than n. To the best of my knowledge, this function is correct.