

17-356/766: Software Engineering for Startups
Spring 2022 Midterm Exam
Michael Hilton and Hyrum Wright

Name: _____

Andrew ID: _____

Instructions:

- Not including this cover sheet, your exam should have 9 pages in total. Make sure you're not missing any pages. Write your full name and **Andrew ID** on at least this page, if not all others.
- Write concise, careful answers. Short and specific is much better than long, vague, and rambling, and grading will reflect this. You have enough time to write clear and readable responses. Bullet points and phrases are acceptable. Spend time to consider how best to present your answers, including citing examples to make your points more concretely.
- Clearly indicate and write your answers in the space provided below each problem. We cannot give you points for answers we cannot find or read.
- The exam has 7 multi-part questions with a maximum score of 80 points. The point value of each problem is indicated. We planned the exam to allocate approximately one minute per point.
- You may consult one sheet of paper with notes. You may not use books, a calculator, cell phone, laptop, or any other electronic or wireless device.
- Good luck!

Question 1: Process (20 points)

- (a) (6 points) Consider the following user story:

“As a baker, I want to sell donuts via Dronuts”

Identify two reasons this is a bad user story, according to INVEST principles, then rewrite a better version that fixes these problems.

Reason 1:

Reason 2:

Rewritten user story:

- (b) (8 points) Provide an example of an epic for the Dronuts project, then break it down into at least 3 user stories.

Epic:

User story 1:

User story 2:

User story 3:

- (c) (6 points) For each of the three stories in the previous question, give a T-shirt size estimate, and provide a concise justification for your estimate.

Estimate:

Justification:

Estimate:

Justification:

Estimate:

Justification:

Question 2: Architecture (20 points)

(a) (2 points)

What are two advantages of a microservice based architecture?

(b) (2 points) What is a disadvantage of a microservice based architecture?

(c) (2 points) What are two reasons that we design microservices to be stateless?

(d) (6 points) Dronuts is wildly popular, and you now need to scale to multiple cities. Is your first step to scale vertically or horizontally? Choose one, but give one argument for and against each approach.

Reason to scale vertically:

Reason to NOT scale vertically:

Reason to scale horizontally:

Reason to NOT scale horizontally:

My choice (circle one):

Scale Horizontally

Scale Vertically

- (e) (8 points) Eventually you decides to break up Dronuts into a microservices architecture. How many microservices would you break your groups Dronuts application into? Explicitly list them. Justify why you would break up your application this way.

Writing below this line is permitted but discouraged.

Question 3: Code Review (10 points)

- (a) (4 points) List two possible purposes of code review, and how they improve the quality of the software being written.

Purpose a:

Purpose b:

- (b) (4 points) Discuss the tradeoffs between using code review and not using code review in a startup context. (Give at least one advantage of using code review, and at least one disadvantage of code review)

- (c) (2 points) When would it be appropriate to introduce code review into the startup development process?

Question 4: Testing (4 points)

(a) (2 points) What is one property of tests that we DO want in our automated tests?

(b) (2 points) What is one property of tests that we DO NOT want in our automated tests?

Writing below this line is permitted but discouraged.

Question 5: Viability (12 points)

Integrated Roadways is a startup creating the “real information super highway”, by developing Smart Pavement. According to their website, the Smart PavementTM system, created and patented by Integrated Roadways, is durable, precast concrete sections embedded with digital technology and fiber optic connectivity to transform ordinary roads into smart roads. Each interlocking Smart PavementTM slab incorporates accessible and upgradable digital technology that connects vehicles to the internet and provides real-time information to drivers about traffic, road conditions and accidents. The Smart Pavement system not only provides enhanced connectivity to vehicles on the road, the road itself will actually connect cities and communities with seamless, high-speed data transfer. It truly will become the next Information Super Highway.

(a) (4 points) If you are an engineer at Integrated Roadways, what is something you could do to collect validated learning about potential customers with the least amount of effort?

(b) (8 points) Based on that learning, would your next step might be a concierge MVP or a smokescreen MVP? Please give at least one pro and con for each approach.

Concierge pro:

Concierge con:

Smokescreen pro:

Smokescreen con:

Question 6: Design Considerations (9 points)

In class, we discussed 10 design considerations. For any 3 design considerations of your choosing, give an example of a way to employ this design consideration in the dronuts MVP, and a way to violate this design consideration:

(a) (3 points) Design Consideration 1:

How could you follow this design consideration when designing dronuts?

How could you violate this design consideration when designing dronuts?

(b) (3 points) Design Consideration 2:

How could you follow this design consideration when designing dronuts?

How could you violate this design consideration when designing dronuts?

(c) (3 points) Design Consideration 3:

How could you follow this design consideration when designing dronuts?

How could you violate this design consideration when designing dronuts?

Question 7: Cheat Sheet (5 points)

As discussed in class, we are giving 5 points to students who created a cheat sheet for the exam.

(a) (5 points) Cheat Sheet turned in