

COSC 412

Fall 2023

Assignment 3

Due November 21st, 2024, 11:59 PM

Question 1 (10 points)

Towson University is planning on doing away with the parking permits used previously and moving towards a “pay as you go” system employing price elasticity (i.e., the parking price will change based on current demand for that particular parking garage at a particular time). In such a system, each parking space will be fitted with an RFID sensor to detect if the spot is being used and each parking garage will have several parking pass kiosk systems that will allow a user to purchase a ticket for a requested period of time. To determine the parking price, the kiosk will determine the current system usage (i.e., the demand for parking in all parking garages across campus as well as the kiosk’s home garage) and utilize historical parking demand data for that time period. Users will be able to pay for their parking using a credit card or their TU OneCard.

- a) Please describe what software architectural style you would use for this project. Please provide all the assumptions you use for making the decision, and please justify your answer. **(4 points.)**
- b) We introduced different usability metrics for measuring the usability of a system. For this project, please choose one of the usability metrics, and devise a concrete usability evaluation plan (with goals and requirements. Consider the following components: Scope, Purpose, Sessions, Equipment, Participants, Scenarios, Metrics, Quantitative Metrics) to show your understanding of how to use the metrics to measure the usability of this project. **(6 points.)**

Question 2 (10 points)

- a) Suppose there are 4 users who use the same product to attempt to perform the three tasks.
 - User 1 was able to successfully finish all three tasks in 3 seconds, 4 seconds, and 3 seconds respectively. User 2 finishes task 1 and 3 in 5 seconds and 4 seconds respectively but failed to finish task 2 after 6 seconds.
 - User 3 finished task 1 in 5 seconds but could not finish tasks 2 and 3 after spending 6 seconds and 7 seconds on them, respectively.
 - User 4 was able to successfully finish all three tasks in 6 seconds, 9 seconds, and 3 seconds respectively.

Calculate the ***Time-based efficiency*** and ***overall relative efficiency*** for the above case **(5 points)**

- b) Identify whether the following are a violation of Confidentiality, Integrity, Availability, or a combination of them. Justify your answer. **(5 points)**
 - i. Alice obtained the password to Bob’s bank account, withdrew some amount from his account and changed the password.
 - ii. A hacker gained access to a hospital’s patient record database and locked it
 - iii. A scammer impersonates the police, and obtains your personal information over the phone, and uses that open a new credit line.

Question 3 (10 points)

```
1. def find_max(a, b):  
2.     if a > b:  
3.         max_num = a  
4.     else:  
5.         max_num = b  
6.     return max_num
```

For the above code

- a) Create a control-flow graph. **(3 points)**
- b) Consider the following 2 test cases and calculate, the individual statement coverage and the overall statement coverage **(3 points)**
 - i. Test case 1: a= 5, b =6
 - ii. Test case 2: a = 100, b =120
- c) What is the issue with the calculated statement coverage? What would you recommend increasing the statement coverage? Provide an example **(2 points)**
- d) If your statement coverage is good, there is no need to perform branch coverage. Do you agree or disagree with the statement? And why? **(2 points)**

Question 4 (10 points)

```
1. def triangle_category(side_a, side_b, side_c):  
2.     if side_a == side_b or side_b == side_c or side_a == side_c:  
3.         print ("Isoceles")  
4.     else:  
5.         print("not isosceles")
```

For the above code:

- a) Create a control flow graph **(2 points)**
- b) Calculate the individual condition/decision coverage and the overall condition/decision coverage for the following test cases: **(5 points)**
 - i. Test case 1: a = 5, b = 5, c = 6
 - ii. Test case 2: a = 5, b = 6, c = 7
 - iii. Test case 3: a = 5, b = 5, c = 5
- c) Which technique can be used to reduce the number of possible tests for condition/decision coverage? Apply that to the problem and show how many outcomes can be eliminated. **(3 points)**

Question 5 (10 points)

Identify an issue (technical issue) in your project and suggest a solution or an approach you would try to address it if you had more time.