Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Software Engineering

Final Examination
Year 3, Semester 1 (2024)

SE3010 – Software Engineering Process & Quality Management

Duration: 2 Hours

May/June 2024

Instructions to Candidates:

- This paper has four questions.
- Answer all questions in the booklet given.
- The total mark for the paper is 100.
- This paper contains six pages, including the cover page.
- Calculators are allowed

Question 01 **(30 marks)**

Part A

a) Recommend suitable specification-based test case design techniques and illustrate how you identify ALL optimum sets of test cases for testing the business requirements given below applying the knowledge gained on specification-based test case design techniques:

i. **GoDrive**, a vehicle hire company, has an application that calculates the hire cost based on the mileage driven. The application must output the following based on the distance traveled:

(10 marks)

Distance Travelled	**Output**
Distance <= 0	Print "Invalid Mileage!"
0 < Distance <= 40	Cost = Distance * 25; Print Cost
40 < Distance <= 80	Cost = Distance * 18; Print Cost
80 < Distance <= 120	Cost = Distance * 12; Print Cost
Distance > 120	Cost = Distance * 9; Print Cost

ii. A coffee shop introduces a loyalty program with a point system for purchases based on customer status and special promotions as follows:

- **New customers** earn **20 points** for every dollar spent on their first visit.
- **Regular customers** earn **10 points** for every dollar spent.
- **Customers with a special event pass** earn **30 points** per dollar spent during events. (This cannot be combined with the 'new customer' bonus points.)

(10 marks)

Part B

Consider the following code snippet and answer the questions given below.

```
1  import java.util.Scanner;
2
3  public class WindSpeedCheck {
4      public static void main(String[] args) {
5          Scanner sc = new Scanner(System.in);
6          System.out.println("Enter the wind speed in km/h: ");
7          int windSpeed = sc.nextInt();
8
9          if (windSpeed >= 50) {
10             System.out.print(windSpeed + " km/h is considered strong wind.");
11             if (windSpeed >= 70) {
12                 System.out.println(" It's too strong for sailing or flying kites.");
13             } else {
14                 System.out.println(" It's suitable for wind surfing.");
15             }
16         } else if (windSpeed >= 20) {
17             System.out.print(windSpeed + " km/h is considered moderate wind.");
18             if (windSpeed >= 30) {
19                 System.out.println(" It's good for flying kites.");
20             } else {
21                 System.out.println(" It's mild enough for a pleasant walk.");
22             }
23         } else {
24             System.out.print(windSpeed + " km/h is considered light wind.");
25             if (windSpeed <= 10) {
```

```
26          System.out.println(" It's too calm for most wind-based activities.");
27      } else {
28          System.out.println(" It's good for small, lightweight kites.");
29      }
30    }
31  }
32  }
```

a) Calculate the total Cognitive Weight (W_c). **(5 marks)**

b) Find the number of inputs and number of outputs. **(2 marks)**

c) Calculate the Cognitive Functional Size (S_f) of the above code segment. **(3 marks)**

Question 02 **(30 marks)**

Consider the following scenario and answer the questions given below.

Mario runs Starlight Diner, a bustling restaurant known for its late-night dining services and extensive menu offerings. The diner employs a team of chefs, waitstaff, and cleaning personnel who work in shifts to accommodate the 24-hour operational model. Managing the payroll has been challenging for Mario, particularly with varying shift schedules and frequent overtime during weekends and holidays.

To improve the efficiency of the payroll process, Mario decided to adopt an automated system tailored to the unique needs of the diner. He reached out to Advanced Tech Solutions, a company specializing in custom software solutions for the hospitality industry. After a detailed consultation, Mario contracted them to develop the "Diner Payroll Manager," a specialized payroll management system for his restaurant.

This system is designed to automatically track the check-in and check-out times of employees through a biometric system. It will generate detailed weekly and monthly reports on the total hours each staff member has worked. This includes tracking regular hours and identifying overtime, which is paid at an increased rate during late-night shifts and holidays. The system will efficiently calculate the total earnings for each employee, incorporating their regular and overtime hours, simplifying the payroll process for Mario's diverse team.

a) Identify 3 system requirements based on the above scenario. **(3 marks)**

b) Recommend 2 types of functional testing for the above scenario and describe them. **(5 marks)**

c) Recommend 2 types of non-functional testing for the above scenario and describe them. **(5 marks)**

d) Later Mario came up with a change request to generate detailed reports on benefits enrollment, costs, and usage that can be used for compliance with local labor laws and regulations, as well as for internal auditing and financial planning.

   i. Based on the change request in (d) what is the type of testing that should be performed. **(3 marks)**

   ii. Justify your answer. **(6 marks)**

e) Based on the requirements you identified in part (a) write one Unit test case for **two** of them specifying at least one assertion. **(8 marks)**

Question 03 **(20 marks)**

Consider the following scenario and answer the following questions given below.

Imagine you are the lead QA engineer for a startup called "TrailMix," which is developing an application tailored for outdoor enthusiasts. This app provides users with detailed maps, weather forecasts, trail reviews, and real-time wildlife alerts. The team utilizes Agile and DevOps methodologies to support continuous integration and deployment. The application must perform reliably across various devices and under different operational conditions, including fluctuating network speeds and periods of offline use.

a) Use your understanding of test automation to explain how it could be integrated into the continuous integration and deployment cycle for "TrailMix". **(4 marks)**
Hint: Consider how to handle the app's requirements for device compatibility and real-time data processing.

b) State **two** challenges of automated testing for a dynamic, data-driven application like "TrailMix". **(3 marks)**

Hint: Focus on data variability, interaction complexities, and external API integrations.

c) Recommend a test automation tool suitable for "TrailMix" and justify your choice based on critical factors such as compatibility, ease of use, and community support. **(7 marks)**
Hint: Consider the specific requirements for testing functionalities that handle real-time data and offline capabilities.

d) Evaluate **two** potential limitations of relying solely on test automation for ensuring the quality of "TrailMix". **(6 marks)**
Hint: Discuss elements such as user experience, device-specific issues, and real-time data testing, which may be challenging to fully automate.

Question 04 **(20 marks)**

a) Identify **three** benefits of using automated testing tools and strategies in a cloud environment. **(6 marks)**

b) Differentiate between performance testing and stress testing and discuss the importance of each type of testing in ensuring service reliability and scalability. **(6 marks)**

c) Interpret **two** challenges of performing security testing in a cloud environment (SaaS, PaaS, IaaS) compared to traditional on-premises testing. **(8marks)**

END OF EXAMINATION PAPER