00513

Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Information Technology

Final Examination
Year 2, Semester 1 (2022)

IT2020 – Software Engineering

Duration: 3 Hours

June 2022

Instructions to Candidates:

- This paper has 5 questions.
- Answer all questions in the booklet given.
- The total mark for the paper is 100.
- This paper contains 7 pages, including the cover page.
- Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Question 1 — 25 Marks

Read the scenario and draw a **sequence diagram** using suitable boundary, control, and entity classes.

" ZigZag" is a popular Online Clothing Store that handles a massive number of clients in Sri Lanka. Any user can register with the system to purchase clothes using his/her valid NIC number and email address for the very first time. Then the user will get a userID and a password. After that he/she can log in to the system for any purchases using a valid userID and the password.

To view premium clothing, the user must log in to the website. After a successful login, the user can see premium clothing with more details button. For each dress, the user first checks the availability in the shopping catalog via shopping UI and if the dress is available only users can request to purchase it by adding those dresses to the shopping cart.

When the user presses the finish button, the system will generate the Payment Summary and show it to the user. Then the system will request payment details as the confirmation of purchase. After receiving payment details as the confirmation of the process system validate it through the third-party payment gateway.

For valid payment details system will show the successful Msg and at the same time issue the electronic receipt to the user. Unless the system will show the "invalid details" message and decline the process.

Note: Please note that the login Sequence diagram has been already drawn and it is available for re-use.

Question 2 — 25 Marks

Given below is a detailed description of a web-based application developed for an online Hospital Management system "E-Health". Model a **physical diagram** for the following description.

Note: You MUST use appropriate operating systems in required places.

Desktop users access the E-Health application via E-Health Web App through the browser. The registration and appointment applications reside in a web server that is inside the Dell hardware server. Appointment application access the iRegistration component which implements by the registration component. The main Healthcare component is having two sub-components: patient and doctor. The Healthcare component resides in a Dell Poweredge server. The patient component accesses the iDoctor

interface realized by the doctor component. Also, the patient component accesses iAppointment interface of the appointment component via port P1.

HR and Finance are subcomponents of the Admin application. Admin application resides within ThinkSystem ST50 server. HR and Finance subcomponents access the Health Care component via iHealth interface through port P2.

Dell hardware server connected to both Desktop and Dell PowerEdge server via local area network. Also, the Dell PowerEdge server is connected to ThinkSystem ST50 server via a wide area network. Also, the Desktop browser communicates with Dell hardware server OS via HTTP protocol.

Question 3 — 25 Marks

Part 01

Based on the given code answer the questions given below. (10 marks)

```
sum_tot = 0
x = int (input ())
while x != 0:
      sum_tot += x
       if sum_tot >= 22:
                print ('Total sum is', total_sum)
                break
     x = int (input ())
print ('Total sum is less than 21 and is equal to', sum_tot, '.')
```

a) Consider the above code and calculate the final statement coverage percentage when input following set of values in a sequence. (04 marks)
5, 4, 7, 0

b) Consider the above code and calculate the final statement coverage percentage when input following set of values in a sequence.
9, 6, 9 (04 marks)

c) How many branches are in the given code segment? (01 mark)

d) Calculate the minimum number of test cases required to achieve 100% branch coverage for the above code? (01 mark)

Part 02

Consider the partial code segment given below. Answer the below questions. (15 marks)

```
#include <stdio.h>
int main ()
{
     int value=2;
     switch(value+1)
     {
         case 1:
           printf("Case 1: Value is: %d\n", value);
           break;
         case 2:
           printf("Case 2: Value is: %d\n", value);
           break;
         case 3:
           printf("Case 3: Value is: %d\n", value);
         default:
           printf("Default: Value is: %d\n", value);
    }
     do
     {
           printf("Value of variable value is: %d\n", value);
           value++;
     } while (value<5);
     return 0;
}
```

a) Draw the control flow diagram. (04 marks)

b) According to the control flow graph, how many branches in the code? (01 mark)

c) Calculate the branch coverage percentage in the given code? (04 marks)

d) Calculate the minimum number of test cases required for full branch coverage (Show the branch coverage as a percentage for each test case). (06 marks)

Question 4 (17 marks)

a) Unilever Sri Lanka is a Sri Lankan consumer goods company located in Colombo. The local headquarters of the company update the prices of products frequently according to the customer demand and availability. All the registered distributors and sellers of their products perform their transactions based on the updated prices published by the headquarters. Once the prices are updated, they will be notified to the relevant interested parties as well as they will be displayed on the Unilever Sri Lanka website to make that information available to the public. (05 marks)

i. What is the design pattern that you will use when modeling this scenario? State your reason(s). (01 mark)

ii. Draw the class diagram for the identified design pattern with relevance to the scenario. (04 marks)

b) "Party Vibes" is a web-based online application that allows creating greeting cards, online invitations and customized calendars. There are free sample templates of each type, which can be directly downloaded or printed by a user. Users can also, customize cards, invitations and calendars as they wish, by adding images, sounds, poems and quotes. Customized items can be downloaded or printed after making the payment that adds up. (06 marks)

i. What is the design pattern that you will use when modeling this scenario? State your reason(s). (01 mark)

ii. Draw the class diagram for the identified design pattern with relevance to the scenario. (05 marks)

c) Consider following code segment and answer the subsequent questions. (06 marks)

```
public interface Ticket {
    public void setName(String name);
    public void setFare(int fare);
    public void printTicket();
}


public class RailwayTicket implements Ticket {
    private String type;
    private int fare;
```

```
    private String name;

    public RailwayTicket(String type){
        this.type = type;
    }

    public void setName(String name){
        this.name = name;
    }

    public void setFare(int fare){
        this.fare = fare;
    }

    @Override
    public void printTicket(){
        System.out.println("--------TICKET--------");
        System.out.println("Name : "+ name + "\nTicket Type : "
            + type + "\nFare : " + fare);
    }
}
```

```
import java.util.Map;
import java.util.HashMap;

public class TicketFactory {
    private static Map<String, Ticket> ticketMap
        = new HashMap<String, Ticket>();

    public static Ticket getTicket(String type, String name, int fare){
        Ticket ticket;
        if(ticketMap.containsKey(type)){
            ticket = ticketMap.get(type);
        } else {
            ticket = new RailwayTicket(type);
            ticketMap.put(type, ticket);
        }

        ticket.setName(name);
        ticket.setFare(fare);

        return ticket;
    }
}
```

```
import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;

public class TicketBookingSystem {
    public static void main(String args[]) throws IOException{
 BufferedReader br=new BufferedReader(new InputStreamReader(System.in));
 Ticket ticket;

 for(int i=0; i < 5; i++){
     System.out.println("Enter ticket type, Name and Fare");
     String[] stringList = br.readLine().split(" ");
     ticket = TicketFactory.getTicket(stringList[0], stringList[1],
               Integer.parseInt(stringList[2]));
     ticket.printTicket();
 }
    }
}
```

i. Identify the suitable design pattern for the above code segment. (01 mark)

ii. What is the main purpose of using the design pattern you have mentioned above for this solution? (01 mark)

iii. Draw the class structure of the design pattern that you identified in part (i) with appropriate classes and methods for the above scenario. (04 marks)

Question 5 (08 marks)

a) Explain three types of triggers in the state machine diagram with examples. (03 marks)

b) Explain the main difference between the sequence diagram and the communication diagram. (02 marks)

c) What is an incident in an incident management system? (01 mark)

d) What are the steps of Incident Management process? (02 marks)

---------- END OF THE QUESTION PAPER ----------