



Sri Lanka Institute of Information Technology
B.Sc. Special Honours Degree/ Diploma
in
Information Technology

Year 2, Semester I (2019)

IT2020 - Software Engineering

Duration : 3 Hours

Instructions to Candidates:

1. This paper contains **five** Essay Type Questions with a total of 100 marks.
2. Answer all questions in the booklet given.
3. This paper contains 7 pages with the Cover Page.
4. Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Question 1**(22 marks)**

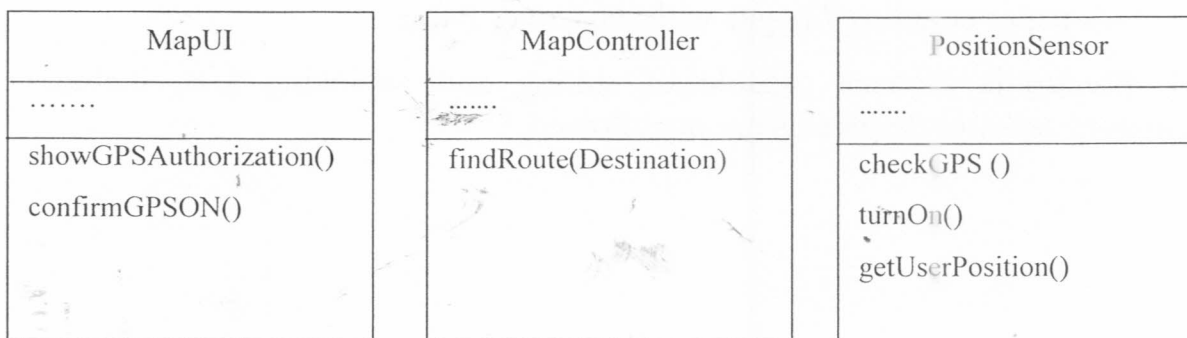
Draw a sequence diagram for the following scenario. Class structure for the main process is given below.

“Easy Map” is a Satellite based Navigation System, designed for mobile phones, which helps to find the best route for a destination location from the user’s current position.

A user has to login to the system first, in order to find a route. After a successful login, the user will request to find the route by providing a destination location to the system through EasyMap user interface. Then the system will check whether the Global Positioning System (GPS) is turned on in the device to get the user’s current location. If the GPS is turned off, the system will prompt a message to user, asking for the permission to GPS authorization. Once the user confirms to turn On GPS, the system will turn on GPS. Then, the system will get the user’s current position.

Once the system receives the current location of the user, it will find the best route by passing source and destination as parameters. Then the system will check for traffic on different routes heading to the given destination. At the same time, the system will calculate the distance of different routes. After receiving the traffic conditions and distance of each route, the system will calculate the Estimated Time of Arrival for each route. Then system will select the best route based on Time of Arrival and send details such as time, route coordinates and distance to MapAppHandler class. MapAppHandler class will then update these details on the Map. Then the updated map will be displayed to the user. Since the traffic of the given best route could change over time, the system should check continuously for faster routes from user’s new location and update the map until the user reaches their destination.

Hint: Assume that, User Login interaction is already modeled in another diagram. You can re-use it for the sequence diagram. You may use suitable boundary, control and entity classes to indicate login process.



MapAppHandler	MapApplication	Map
.....
findBestRoute(S,D)	checkTraffic() calcDistance() calcTime() selectBestRoute()	updateMap()

Question 2**(16 marks)**

Given below is a detailed description of a web based application developed for an online shopping store “EasyBuy”. Model a **physical diagram** according to the given description.

This application can be used by both mobile and desktop users to order goods. Desktop is installed with Windows operating system. Desktop users can access the system through browser using “EasyBuy” web application while the mobile users need to install this “EasyBuy” mobile application which will run inside the android OS.

The main WebStore application runs in an Application Server, which is installed in the Dell PowerEdge Server. WebStore application contains three sub components SearchEngine, ShoppingCart and Authentication related to online shopping. SearchEngine component allows to search or browse items by ProductSearch interface to both desktop and mobile users. Also, SearchEngine component uses SearchInventory interface of Inventory component. Inventory component resides inside Linux operating system of IBM Server. Authentication component implements UserSession interface for ShoppingCart component to use.

Accounting application which contains three sub components Orders, Customers and Accounts is installed in a separate HardwareServer which runs SunSolaris operating system. ShoppingCart component uses ManageOrders interface provided by Orders component during checkout. Authentication component access Customers components through ManageCustomers interface. Furthermore, inventory components realizes ManageInventory interface which is accessed by Orders component.

ApplicationServer is connected with Desktop users and mobile user through http protocol. Dell PowerEdge Server is connecting with IBM Server and HardwareServer through a wide area network.

Question 3**(22 marks)**

- a) Draw a control flow graph for the partial code segment given below.

(10 marks)

```
boolean isRaining, isSnowing;
int temp;
if (isRaining)
{
    if(temp >45)
        System.out.Println ("Wear light weight rain coat");
    else
        System.out.Println ("Wear fleece rain coat");
}
else if (isSnowing)
{
    if(temp > 20)
        System.out.Println ("Wear soft shell jacket");
    else if (temp >0)
        System.out.Println ("Wear down jacket");
    else
        System.out.Println ("Wear base layer and down jacket");
}
else
    System.out.Println ("Wear Casual");
```

- b) Consider the same partial code segment given above. Calculate the minimum number of test cases required for a full branch coverage. (Show the branch coverage as a percentage for each test case)

(12 marks)

Question 4**(25 marks)**

a)

Assume that there is a blog and users can register for that blog. When a new article is published in the blog, it will be informed to the registered users saying a new article is published. Then the user will log to the blog and read the new article published. If users need, they can access specific articles from the blog.

i) Suggest a suitable design pattern and justify your answer.

(2 marks)

ii) Draw the relevant class diagram including appropriate methods which can be used for the given scenario.

(6 marks)

b)

In the computer game "Attack Rigid" we need to create ten different types of attackers. All attackers are same in the structure. The difference is the jacket colour. Each player use minimum 5000 from each type and according to the progress as special offers can get more attackers.

i) Suggest a suitable design pattern and justify your answer.

(2 marks)

ii) Explain the pattern using a class diagram.

(5 marks)

c) Consider the code given below and answer the questions.

(10 marks)

```

class Order {
public void createOrder () {}
}

class Prodcut {
public void addProdcut () {}
}

class Stock {
public void updateStock () {}
}

class Shipment {
public void createShipment () {}
}

class OrderItems
{

private Order order1 = new Order();
private Prodcut prodcut1 = new Prodcut();
private Stock stock1 = new Stock();
private Shipment shipment1 = new Shipment();

public void placeOrder ()
{
order1.createOrder();
prodcut1.addProdcut();
stock1.updateStock();
shipment1.createShipment();
}
}

```

- i) Identify the design pattern used in the code. (1 mark)
- ii) What is the main purpose of using the design pattern you have mentioned above for this solution? (1 mark)
- iii) Draw the class structure of the design pattern that you identified in part i with appropriate methods for the above scenario. (8 marks)

Question 5**(15 marks)**

- a) Draw a state machine diagram for the following scenario which describes the operation of a Sandwich Toaster. (10 marks)

Initially, the toaster is in the Power off state. It will move to Power on state once switched on. At the entry of the Power on State, the toaster is turn on its heater and turn on its green light. While in the Power on state, the toaster increases the temperature to 275 degrees. When temperature reaches to 275 degrees, the toaster moves to Operating state. While in the Operating state the toaster maintains its temperature in 275 degrees. After 5 minutes in the Operation state, the toaster automatically goes to ToastReady State. When enter to the ToastReady state, the toaster turn on its red light. This is the sign to take the toast out. ToastReady state has a exit action of Turn off Red light. While in ToasterReady state, when someone switchoff the toaster, it moves to Power off state again. Also, switchoff the toaster is possible from Operating state as well as from Power on state which moves back to Power off state.

- b) Explain the difference between Code line and Base line in Version Management.

(2 marks)

- c) Briefly explain the Process of Incident Response in Incident Management. (3 marks)

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