Take home Exercise 2 - 100 Marks due 27 May 2020 at 23:59 hours

Question 1 20 marks

Read the scenario below and answer the questions that follow:

The customer must pass authentication before withdrawing money. Authentication is done by typing in a PIN (personal identification number). The PIN can be either correct or wrong. Unsuccessful attempts are counted and if the counter exceeds a limit, the customer is unable to withdraw money.

1.1 Name and distinguish two broad categories of UML diagrams. Provide an example for each category. (4 marks)

1.2 Provide five steps that are required to draw a state diagram. (2.5 marks)

1.3 Draw a state diagram for the given scenario. The card should be ejected if it is not readable by the ATM machine, the PIN is incorrect and if there are insufficient funds in the account. In order to withdraw money the customer must check the balance. (7.5 marks)

1.4 Draw a use case diagram to illustrate the above scenario. Take into consideration that the ATM machines are maintained and repaired by a technician and the customer is issued with a receipt after performing the transaction. (6 marks)

Question 2 30 marks

Read the scenario below and answer the questions that follow:

WEKA is one of the biggest colleges in China and has around 1000 students. The college has constructed a library in the campus for students to have access to resources. The management has proposed the development of a modern library system. The system should allow students to loan books for certain periods. The Librarian is responsible for issuing out and receiving those books back.
Management of WEKA approached you to assist in the development of the proposed system. They are not sure which the best methodology to use in this project is and have asked you to advise them between the waterfall model and prototyping.

2.1 Write a report that evaluates the advantages and disadvantages of the two models identified from the scenario. (16 marks)

2.2 Construct an activity diagram for WEKA library management system. (14 marks)

Question 3 30 marks

Read the scenario below and answer the questions that follow:

After viewing available seats, on the website of the Pretoria Bus Services, the customer can then login and reserve the seat by directly paying for it through the website. If the customer has not paid for the seat, the bus company can cancel the seat. Also, if the customer does not show up one hour before the trip, the seat can be cancelled.
When the reservation is cancelled, the seat will become available and can be sold to another customer. If there is no cancellation, they assume that the customer will take up the seat they have booked.
Both the customer and the company staff must authenticate themselves for performing operations with the system.

3.1 List and explain three non-functional requirements that could be important for the above system. (6 marks)

3.2 Distinguish the difference between the <<extend>> and <<include>> relationships in use case diagrams. Include an example from the scenario of an <<include>> relationship. (3 marks)

3.3 Create a use case diagram for describing the functional requirements of the above system. (11 marks)

3.4 Draw an activity diagram to describe the details of the above system. (10 marks)

Question 4 20 marks

4.1 Discuss 5 principles that make the SOLID acronym, that provides the benefit of a reusable, maintainable, scalable and easy testable codebase in software engineering. The intention of these principles is to make software designs more understandable, easier to maintain and easier to extend.

S - Single Responsibility principle
O- Open /Closed principle
L - Liskov Substitution principle
I- Interface segregation principle
D - Dependency Inversion principle 15 marks

4.2 Define and differentiate between Coupling and Cohesion. 5 marks