Tutorial 6 : Interaction Diagrams

Question 1

Construct a ***design sequence diagram*** to illustrate the Flight Ticket Reservation) use case *"Book flight ticket"* (refer to T3Q1 with the following descriptions:

"To book flight ticket, customer is required to fill in flight requirements such as origin, destination, departure date, return date and number of passengers. System will show all the available flights based on the flight requirements provided by customer. Customer will then select the preferred scheduled and enter the passenger details. Once customer confirmed the flight booking, the booking record will be created."

You are required to include actor, boundary (UI) object, control object, entry objects and object creation in your diagram.

Area	Marks Allotted
Correct actor, boundary(UI), control and entity objects	3
Correct new object creation	2
Logical flow of events with messages clearly labeled	5
Correct notations used	1

Question 2

ABC shop is a medium-sized furniture shop located at Wangsa Maju, Setapak. The shop provides high-quality furniture for its customers.

When a customer wishes to make a sales order via online, he or she needs to provide some basic information such as customer's name and contact number. The system will check the customer status. However, if the customer is a new customer, he or she must register first before making any order.

For each online sales order, the customer is allowed to view the products online and add to cart. If the order is valid, the system will prompt for confirmation. Once the customer has confirmed the sales order details, the system will display the total payable amount. The customer may choose either to make full payment or partial payment. After the customer has done the payment, the system will add the sales order and payment details into the system. Lastly, the system will generate the online receipt for the customer.

Construct a ***design sequence diagram*** that shows a normal flow of events for use case *"add customer order"* for Online Furniture Sales Ordering System.

You are required to include actor, boundary, control and entity objects. Do not include focus of control.

Area	Marks Allotted
Correct actor, boundary(UI), control and entity objects	3
Correct new object creation	2
Logical flow of events with messages clearly labeled	6
Correct notations used	1

Question 3

MyGift.com is a website selling souvenir from all over the world. The three different categories of gifts are: man, woman, and kids.

Construct a ***design collaboration diagram*** for "***Create NewPromotion Event"*** use case for MyGift.com. Assuming that the administrator has login. You are required to include boundary (UI) object, control object, entity objects and object creation in your diagram.

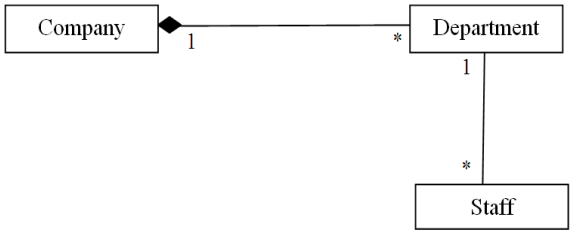
Area	Marks Allotted
Correct actor, boundary(UI), control and entity objects	3
Correct new object creation	2
Logical flow of events with messages clearly labeled	6
Correct notations used	2

Tutorial 7 : Specifying Operations

Question 1

Explain **TWO (2)** reasons Object Constraint Language (OCL) is needed to specify operations in a class.

Question 2



Refer to the diagram above, write OCL based on the following assumptions:

a) A set of all departments in the company

b) The staff whose payroll number is 12345

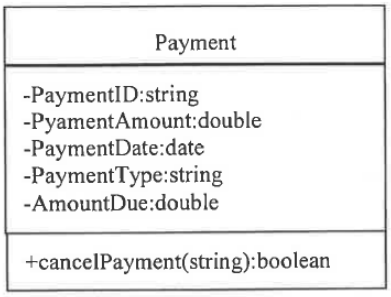
c) Get the age of an employee

d) All employee are aged 18 or above

Question 3

The following diagram shows **Payment** design class diagram for the Online Furniture Sales Ordering System

Construct **TWO (2)** Object Constraint Languages (OCL) for the Payment class.



Question 4

Write Object Constraint Language (OCL) equivalent for the following constraints:

a) A company only hires employee that is age 20 and above.
b) An employee who registers one car sticker in the company must possess at least two years of driving experience.
c) If an employee is promoted to senior level, the monthly bonus is at least RM500.
d) A manager must possess at least 5 years of managerial experience.

Tutorial 8 : State Diagrams

Question 1

Construct a state chart diagram for flight schedule class with the following descriptions:

Once the customer has booked the flight ticket, the customer can keep track his/her flight by checking the flight status online. When an airline staff added a new flight schedule, the initial status of flight is set to *Scheduled*. If the flight is going to depart 15 or more minutes after its scheduled departure gate, the flight status will change to *Delayed*. When the flight has left the departure gate, the flight status will change to *Departed*. When the flight is airborne and the takeoff time is the "wheels up" time, the flight status will change to "In Air". Lastly, when the flight has arrived at its destination gate, the flight status will change *Arrived.*

Area	Marks Allotted
State	5
Event name	2
Guard condition	1
Action-expression	2
Correct notation	1

Question 2

Momo.com is an e-commerce system selling a wide range of products in categories from electronic devices, healthcare, toys, groceries, fashion and sports equipment. The main purpose of this system is to ease the online users in purchasing the products through their personal computer, laptop or smartphone at anytime and anywhere.

"In momo.com, the customer can place the order at his/her convenience. Once the customer has placed the order, the customer is able to track his/her order status from his/her account. When there is a new order placed by customer, the order status is set to "New". After the payment has been made successfully, the order status will change to "Confirmed". The customer order will be sent to the respective sellers for packing the product ordered. The order status will then change to "Packing". After the product packing process is done, the respective sellers will directly ship the product to the customer through logistic company. At this point, the order status will change to "Shipping". Lastly, when the product has reached the customer, the order status will show as "Delivered" in the customer account."

Construct a ***state chart diagram*** based on the descriptions given above.

Area	Marks Allotted
State	5
Event name	2
Guard condition	1
Action-expression	1
Correct notation	1

Question 3

JHJ bank is offering new credit card with exclusive features to customers. A customer with/without JHJ bank account can apply the new credit card by filling in an online credit card application form (CreditCardApplication.aspx) in the JHJ website. The form will be sent for processing (processed by Application.cs) once the customer has filled in all mandatory fields. The customer can check the application status through a Tracking.aspx page. New application will show "New" status in the tracking page. Application.cs will retrieve status from Application table in the database. Bank staff will then check customer's financial background and "Approve/Reject" the application. Once the application has been processed by bank staff, bank manager will go through all records and confirm the application. This approving process is carried out through ApproveReject.aspx webpage and Notification.cs will notify customer regarding the application result. After this, application status will be changed to "Successful/Fail". Failed application will end here. Dispatch department will receive notification regarding the successful application and process the new credit card delivery through Notification.cs. Once the credit card is collected by the Courier Service, status of the application will be changed to "Pick Up". The status will then be updated by the Courier Service third party which includes: "At Hub" → "At Location Branch" → "Delivered" or "Fail Delivery". DeliveryStatus.cs will be used to update/retrieve the status. Once the new credit card has been received by the customer, activation must be done within seven days or else the credit card will be de-activated. All records will be stored for one year.

Construct a ***state chart diagram*** for *CreditCard* class.

Area	**Marks**
Correct states	6
Correct notation	1
Correct guard messages	2
Correct transition messages	2

Tutorial 9: Software and System Architecture

Question 1

In the design of software architecture, layering and partitioning are two important approaches that will be used by most software engineers.

Differentiate between *partitioning* and *layering* in the system development context and explain why system developers prefer to divide a software system into subsystems with different layers.

Question 2

Momo.com is an e-commerce system selling a wide range of products in categories from electronic devices, healthcare, toys, groceries, fashion and sports equipment. The main purpose of this system is to ease the online users in purchasing the products through their personal computer, laptop or smartphone at anytime and anywhere.

a) Design a ***component diagram*** for Momo.com e-commerce system that consists of the following components:

User Interface	Login.jsp, Main.jsp, product.jsp, ShoppingCart.jsp, TrackOrder.jsp
Application Classes	Application.java
Database	Momo.mysql

b) Design a ***deployment diagram*** for momo.com e-commerce system. The system is resided in one Application Server and it consists of one Database Server.

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a) Construct a ***component diagram*** for JHJ bank's credit card application system.

Area	**Marks**
Correct components	3
Correct notations used	1
Correct association between components	2

b) Design a ***deployment diagram***. The system is resided in one server with firewall installed for security purpose. Customer can use smart phone, laptop, or Ipad to use the system.

Area	**Marks**
Correct nodes	3
Correct notations used	1
Correct association between nodes	1

Question 4

ABC shop is a medium-sized furniture shop located at Wangsa Maju, Setapak. The shop provides high-quality furniture for its customers.

When a customer wishes to make a sales order via online, he or she needs to provide some basic information such as customer's name and contact number. The system will check the customer status. However, if the customer is a new customer, he or she must register first before making any order.

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Based on the case given above, propose a simple *three-layer architecture* for the Online Furniture Sales Ordering System.

Area	Marks Allotted
Correct packages with three layers	6
Correct notation	1
Correct dependency	1

Tutorial 10: System Design & Details Design

Question 1:

a) What is *coupling*? Is this desirable or undesirable in a system? Why?

b) What is *cohesion*? Is this desirable or undesirable in a system? Why?

Question 2:

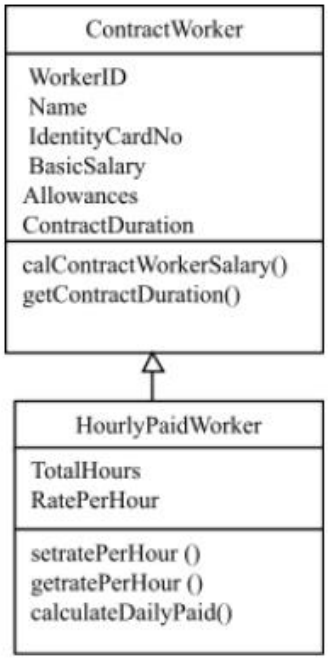


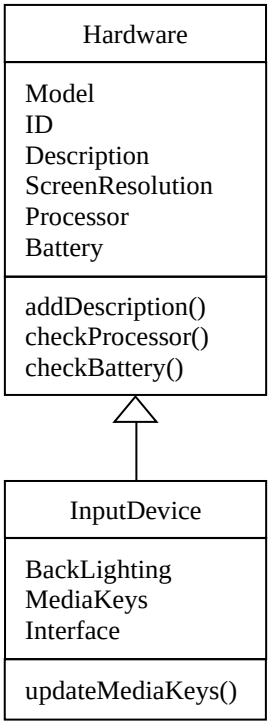
Figure 1: Inheritance hierarchy

a) Based on the Figure 1, explain why the inheritance class hierarchy is violating the **Liskov Substitution Principle (LSP)**.

b) Propose an improved version of the inheritance class hierarchy so that it is adhered to the LSP.

Question 3:

Identify the problem(s) in the following diagram. Suggest a solution by drawing an appropriate class diagram.



Question 4:

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Suggest **FOUR (4)** design qualities that must be included in Furniture online sales order system.

Question 5:

Jim Smith is the owner of a car dealership company. Jim's dealership sells Ford, Honda, and Toyota cars.

The dealership keeps information about each car manufacturer with whom it deals with so that it can get in touch with them easily. The dealership also keeps information about the models of cars that it carries from each manufacturer. It keeps information such as selling price, the price the dealership paid to obtain the model, and the model name and series, for example Honda Civic LX.

The dealership also keeps information on sales. Sale details recorded are such as the name of the buyer, the model name and series of the car bought, and the amount paid for the car. There are 2 types of buyers: individual customer and company customer. In order to contact the buyers in the future, contact information such as address and phone number of the buyer will also be recorded in the new computerized system.

Produce a ***design class diagram*** that will include attributes with data types, operations, ***collection class*** (array), multiplicities and associations design.

Tutorial 11: Data management design

Question 1

What is the key difference between a relational DBMS and an object DBMS.

Question 2

Assuming that staff can maintain many flight schedules. For each flight schedule, it can be maintained by different staff. Design Relational Data Base Management System (RDBMS) tables to map with the scenario. Resolve many-to-many relationship. Suggest appropriate attributes for all the tables.

Area	Marks Allotted
Correct tables with appropriate attributes	9
Correct class association and multiplicity	2

Question 3

Identify the issue in the following class diagram. Construct an improved class diagram and its associating ***relational database design (RDBMS)***.