



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2019 – 2nd Year Examination – Semester 3

IT3105: Object Oriented Analysis and Design
PART 2 – Structured Question Paper

29th June 2019
(ONE HOUR)

To be completed by the candidate

BIT Examination Index No: _____

Important Instructions:

- The duration of the paper is **1 (one) hour**.
- The medium of instruction and questions is English.
- This paper has **2 questions** and **12 pages**.
- **Answer All questions.**
- All questions will carry equal marks.
- **Write your answers** in English using the space provided **in this question paper**.
- Do not tear off any part of this answer book.
- Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate.
- Note that questions appear on both sides of the paper.
If a page is not printed, please inform the supervisor immediately.

Questions Answered

Indicate by a cross (x), (e.g.

x

) the numbers of the questions answered.

To be completed by the candidate by marking a cross (x).	Question numbers		
	1	2	
To be completed by the examiners:			

1. Read the following case study and answer the questions given below.

“Pit Stop” is a vehicle service station located in Colombo Sri Lanka. They are planning on implementing an Information System to enhance their current organisational activities. They provide vehicle maintenance services such as wheel alignment and interior cleaning.

Initially, the customer can register in the system by filling a form which consists of the first name, last name, valid email address, valid mobile number, home address and password. Once this information is provided, the user will be granted access to the customer interface.

After registration, customers are required to enter their email address and password to access the customer interface. If the email address or password is invalid, a message will be displayed on the login screen. Every time when a customer logs in, appropriate validations are carried out and if the credentials are incorrect, necessary error messages will be displayed on the login screen.

Services provided by the organisation can be searched by any user with or without being logged into the system. However, if they want to book a service they must be logged into the system. Services could be searched by typing in keywords or filtering services via the types of services available. Once the customer selects a service, information will be displayed regarding the particular service including prices, service limitations etc.

Registered customers have the ability to book an appointment for any service provided by the organisation. The customer needs to select the service type, service date and service time in making a booking. Then the system will notify the customer whether a service slot is available for the customer’s preferred date and time. If the customer wishes to place the appointment, the vehicle number needs to be entered to the system. An SMS alert containing the details of the booking including the appointment id, date and time will be sent to the customer after completion of the booking.

When a customer brings the vehicle for the appointment, service advisers would take down the mileage and any special requirements and issue a job card. Sometimes it may be necessary to view the previous service records to find details such as when (at what mileage) the gear oil/engine oil change was done and what brand of oil was used etc. The job card needs to be signed by the customer in order to give his/her consent to the service.

Once the service is done, an SMS will be sent to the customer with service and payment details. The customer will be given a choice to make the payment using a credit card or pay by cash. However, if the customer pays using a “JLM” credit card, a 5% discount will be given on the total price. Moreover, once the service is completed, the customer will be notified via email to provide feedback for the quality of the service provided. A feedback interface for the particular appointment will be visible once all the service processes are completed for the given appointment_id. Then the customer can provide feedback and give a rating for the service provided by the organisation.

The customer interface will also display information about the current appointment and past appointments of the particular customer. The customer has the ability to request to change the appointment information or cancel an appointment.

The Manager can generate a set of reports in the areas of service profitability and service demand. Further, the Manager can see all the current appointments and make any changes if necessary. If the Manager modifies any information regarding a customer appointment, the customer will be notified via SMS.

The Manager has the ability to create, update or cancel the services provided by the company. Moreover, the manager will have access to customer feedback and ratings for all the appointments.

(a) Identify the Actors involved in the “Pit Stop” system.

[10 Marks]

ANSWER IN THIS BOX

Customer, Manager

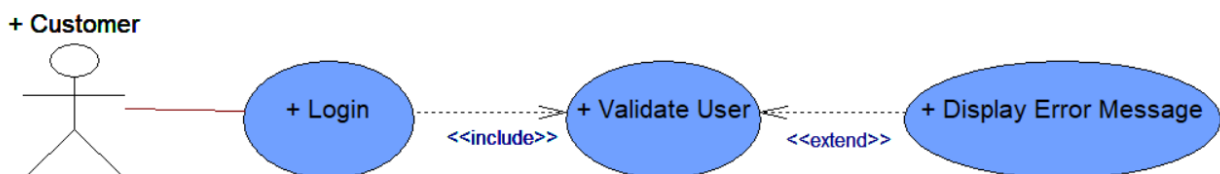
(b) Model the “Login” scenario using the following use cases.

Login, Validate user, Display error message.

Draw the Use case diagram by identifying the relationships. Clearly indicate the stereo types <<include>> and <<extend>>.

[10 Marks]

ANSWER IN THIS BOX



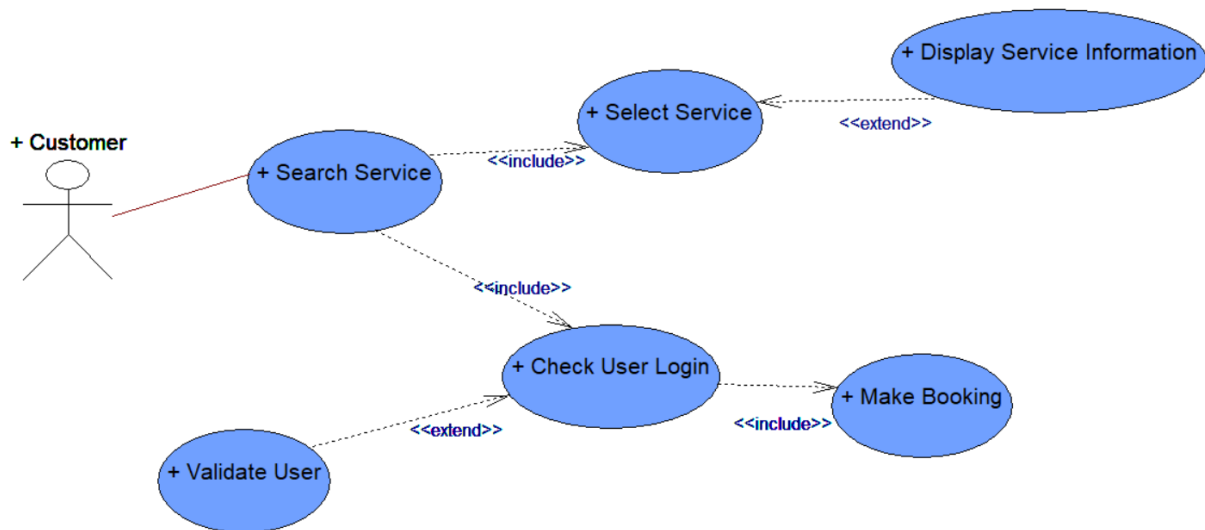
(c) The following use-cases are identified in the “Service Booking” scenario.

Search service, Select service, Display service information, Validate User, Make booking, Check user login.

Draw the Use case diagram to model the above use cases by identifying the relationships.
Clearly indicate the stereo types <<include>> and <<extend>>.

[30 Marks]

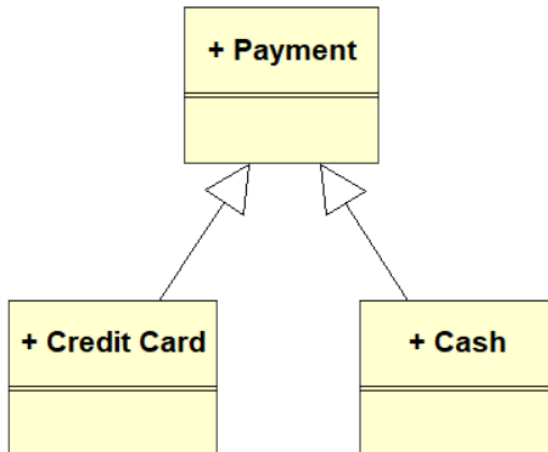
ANSWER IN THIS BOX



- (d) Identify and model the classes involved in a generalization/specialization relationship in the “Pit Stop” system.

[20 Marks]

ANSWER IN THIS BOX



- (e) What is the most appropriate method to model the Discount information in the class diagram?
Give reasons for your answer.

[10 Marks]

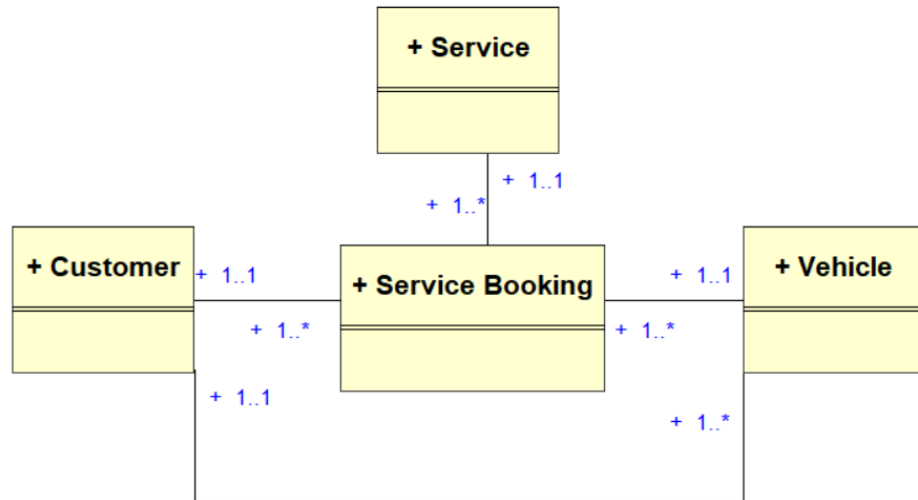
ANSWER IN THIS BOX

Add a separate class as “Discount”
As there are different discounts for different payment types or any other valid reason

- (f) Model the part of the class diagram involved in Service Booking scenario showing the relationships and multiplicities among the classes “Customer”, “Service_Booking”, “Service” and “Vehicle”.

[20 Marks]

ANSWER IN THIS BOX



2

- (a) Select the most suitable word to fill in the blanks from the list of words below and write down your answer in the box provided.

[15 Marks]

List of Words: Inheritance; Polymorphism; Encapsulation; Abstraction; Information hiding; Composition; Interface; Realization

- i. The most critical skill required by modelers is to identify what to include in a model and what to leave out from the model. This concept in OOAD is known as

ANSWER IN THIS BOX

Abstraction

- ii. enables the modelers to define operations in different classes using the same name.

ANSWER IN THIS BOX

Polymorphism

- iii. is also known as information hiding.

ANSWER IN THIS BOX

Encapsulation

- iv. The relationship between a class and an interface is known as

ANSWER IN THIS BOX

Realization

- v. The relationship between two classes which lets one to reuse the attributes and methods in the other class is known as

ANSWER IN THIS BOX

Inheritance

(b) Write down short answers for the following.

[16 Marks]

i. Name three (03) static diagrams drawn in UML.

ANSWER IN THIS BOX

Deployment

Class

Object

Component

ii. List down one (01) similarity and one (01) difference between classes and use-cases.

ANSWER IN THIS BOX

Similarity: Both can inherit

Difference: classes consist of attributes and operations; use cases consists of scenarios.

iii. List down three (03) purposes of drawing a state chart diagram.

ANSWER IN THIS BOX

To Describe different states of an object during its life time.

To Model the dynamic behaviour of a system.

To show the events or messages that cause a transition from one state to another.

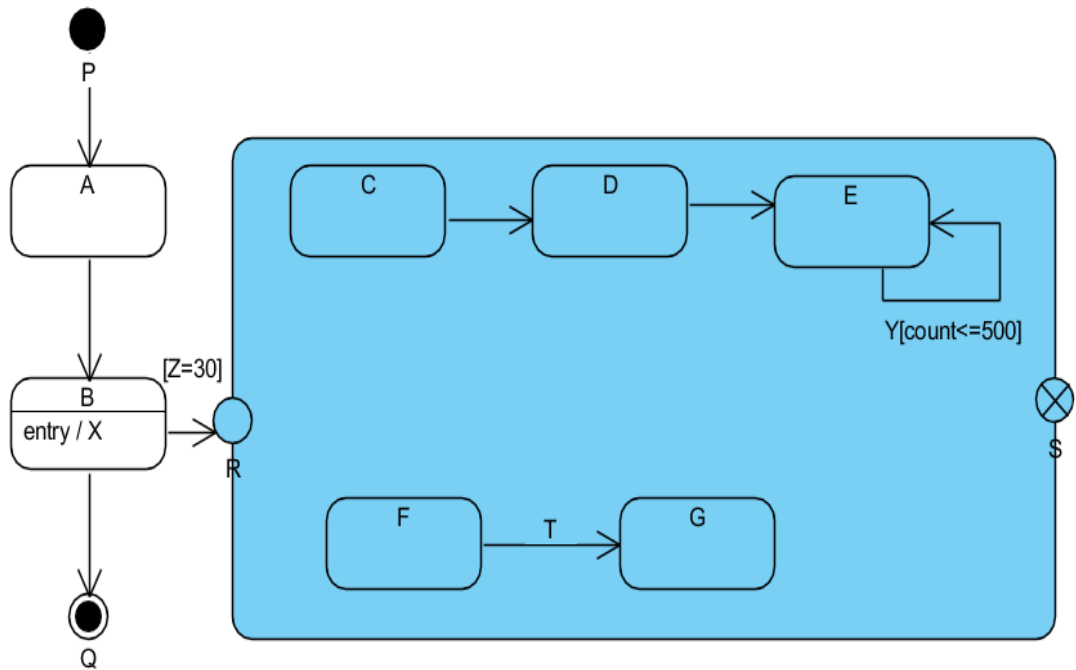
- iv. Name two (02) UML diagrams used to model the behavior of an object.

ANSWER IN THIS BOX

Activity diagram

State chart diagrametc.

- (c) Consider the following state chart diagram drawn in UML.



Give an example for the following notations using the above diagram. First one is done for you.

[24 Marks]

e.g. A Transition:

ANSWER IN THIS BOX

T

- i. A State:

ANSWER IN THIS BOX

F

- ii. A Start state:

ANSWER IN THIS BOX

P / A

iii. A Guard Condition:

ANSWER IN THIS BOX

Z / Y

iv. An Entry Action:

ANSWER IN THIS BOX

R

v. Sequential Sub states:

ANSWER IN THIS BOX

C, D, and E / F and G

vi. Concurrent Sub States:

ANSWER IN THIS BOX

C, D, E and F, G

vii. An Entry Point:

ANSWER IN THIS BOX

R

viii. An Exit Point:

ANSWER IN THIS BOX

S

(d) Consider the following description for a railway ticket reservation system.

“A passenger can reserve railway tickets using this system. Initially the passenger should be able to select the date, the station and the destination. Once the corresponding details are given the system will show a list of trains and their arrival time on that day. All trains have a name and two types of seats; first class and second class. The passenger can book tickets by selecting the appropriate class seats. Tickets are issued only if there are seats available in that particular class. If the seats are available, he/she can reserve tickets using this system. In order to reserve tickets one should fill up a form which includes his/her name, address, age and gender. Next the passenger should enter the number of tickets he/she needs to buy. A maximum of 10 tickets can be purchased at a particular time. Once the number is specified the system will display the amount. Passenger confirms the payment and provides the credit

card details to reserve the tickets. In case of cancellation the passenger should visit the reservation office to do the cancellation. He/she has to fill a form and should hand it over to the reservation clerk to cancel the tickets. Upon that request, the reservation clerk will cancel the tickets and refund the amount to the passenger. All cancellations will be subject to a cancellation fee.”

- i. Identify six (06) classes for the above Scenario.

[12 Marks]

<u>ANSWER IN THIS BOX</u>	
Train	
Passenger	
Seat	
Payment	
Ticket	
Station	

- ii. Clearly specify attributes and operations for two (02) classes identified above (d-i).

[08 Marks]

ANSWER IN THIS BOX

Class: Passenger
Attributes: Name, Address, Age, gender, NIC
Operations: searchTrain(), reserveTickets(), makePayments()

Class: Ticket
Attributes: ticketNumber, startingLocation, endingLocation, passengerNIC
Operations: amount (), cancelTicket ()

- iii. Draw a class diagram for the above railway ticket reservation system, illustrating the relationships and multiplicity.

[25 Marks]

ANSWER IN THIS BOX

