UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2016 – 2nd Year Examination – Semester 3

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

07th May, 2016
(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 **08 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.
- **Non-programmable Calculators may be used.**

Questions Answered

Indicate by a cross (✗), (e.g. ✗) the numbers of the questions answered.

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

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

QCabs is a leading transport service provider in Colombo. Currently the day to day activities of the company are handled manually. The company is in need of a software system to automate their day to day activities. Following describes the requirements of the software system for QCabs.

The receptionist at the QCabs company handles the vehicle registration, driver registration, customer requests, vehicle allocation and payments.

Vehicles owned by the company as well as the outsourced vehicles are used for hiring by QCabs. In registering the vehicles, details of the vehicles including vehicle no, vehicle type, Company owned or outsourced, no. of seats, A/C or Non A/C, A/C type , insurance details, revenue license details need to be recorded and in case of outsourced vehicles the details of the owner including name, address and contact details are also recorded.

Both the drivers attached to the QCabs company and the drivers of the outsourced vehicles need to be registered . In registering, the details of the drivers such as the NIC number, name, contact number, address and driving license number are recorded.

Customers can get the service of the company by visiting the company, making a call to the receptionist or by using the online reservation system. A Customer needs to provide his name and mobile contact number with the other hiring details such as the place to go, required date and time and the duration of the hire at the time of reservation. A text message will be sent to the customer confirming the request and a vehicle is reserved for the customer. Cancellation of the reservations can be done within 24 hours after the reservation but 5% of the fee will be charged as the cancellation charges.

Customer who make the reservation online can make the payment online using the credit card. If payment is by using ABC bank credit card, 7.5% discount is given whereas 5% discount is given for all the other credit cards. Debit card holders also will get 2.5% discount in making the payment. Cash payments can be done only from the QCabs office. No discounts are applicable for cash payments. Receptionists handles the payments.

Availability of the vehicles will be recorded and tracked using the system. In addition the insurance details, license details, repair details of the company owned vehicles can also be tracked using the system.

There should be a facility to generate reports regarding hires, payments, cancellations and vehicle maintenance in the system. |

a) Identify the actors involved in the QCabs system.

ANSWER IN THIS BOX

Customer, Receptionist

(10 Marks)

b) "Make reservation" is identified as one of the use cases in QCabs system.
i. Identify the classes involved in "Make reservation" use case.

ANSWER IN THIS BOX
Customer, Vehicle, Reservation Details,

(20 Marks)

ii. Identify the relationships among the classes identified in 1.b).i and draw the part of the class diagram related to "Make reservation" use case showing the relationships and multiplicities.

ANSWER IN THIS BOX

Customer 1 .... 1..* ReservationDetails * .... 1 Vehicle

(20 Marks)

c) Name the objects which participate in "Cancel reservation" use case?

> **ANSWER IN THIS BOX**
> **ReservationDetails, Customer**
>
>
>
>
> **(10 Marks)**

d) Identify three (3) use cases other than "Make reservation" and Cancel reservation" in QCabs system.

> **ANSWER IN THIS BOX**
>
> **Maintain customer Details, Maintain vehicle details , Maintain driver details, Payment, Allocate Vehicle**
>
> **(There can be more use cases depending on the assumptions)**

e)
i. Identify one example for *extend* and *include* relationships in the QCabs Use Case diagram.
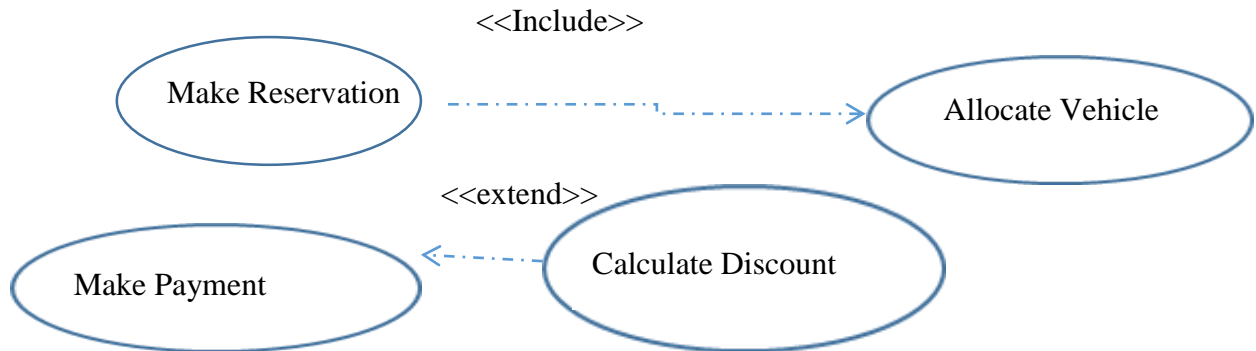
> **ANSWER IN THIS BOX**
> **(Two Possible Answers)**
>
> **MakeReservation......> Allocate Vehicle   ....(include)**
>
> **Make Payment<---------CalculateDiscount   ....(extend)**

ii. Model the relationships identified in 1.e).i using above relationships in UML 2.0

ANSWER IN THIS BOX

<<Include>>

Make Reservation ┈┈┈┈┈┈┈> Allocate Vehicle

<<extend>>

Make Payment <┈┈┈ Calculate Discount

(20 Marks)

2)	a) Draw the corresponding activity diagram for the following use case narration.

| Use Case Name	Farmer Registration
Goal in context	This use case describes the event of registering the farmers with a mobile based agriculture information system using their National Identify Card (NIC) numbers, names and mobile phone numbers.
Primary Actor	Farmer
Preconditions	Farmer should open the application and the user home page is being displayed.
Post Conditions	Farmer has been registered and Farm registration page of the system is displayed.
Assumptions	-
Triggers	This use case begins when farmer clicks on the "Registration" icon or link on the Home page of the application
Typical Course of Events	
Step	Action
1	The Farmer clicks on the registration icon or link.
2	The system responds by displaying the farmer registration page of the application.
3	Farmer enters his NIC, name and the mobile phone number and clicks the [OK] button.
4	The system validates the entered fields.
5	The system sends a PIN number to validate the phone number.
6	Farmer enter the received PIN and click on [NEXT] button.
7	The system displays the "Farm registration" page.
Alternative Courses	
4	If the farmer leave any field empty, the system pop-ups an error message and direct user to step 3.
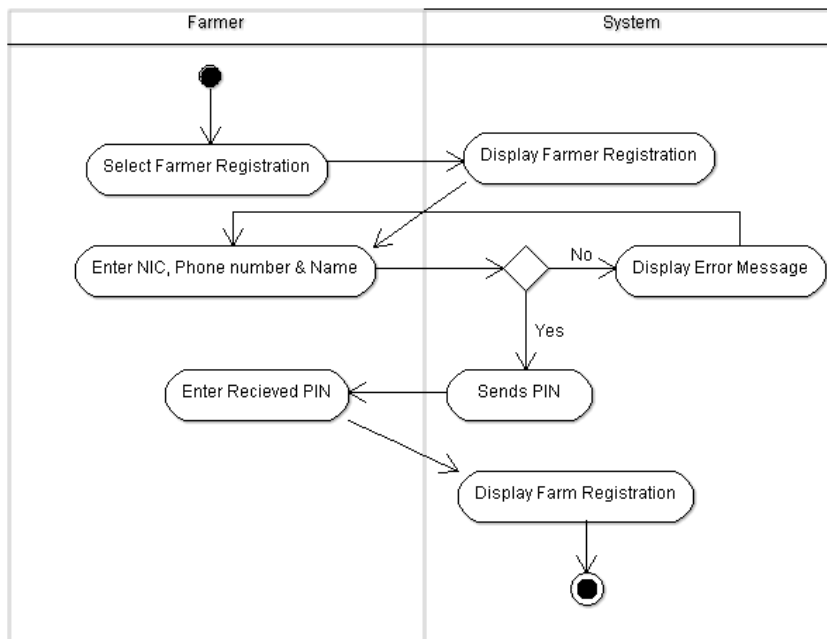
(40 Marks)

b) Consider the following diagram drawn for a car rental company and fill in the blanks using appropriate words or phrases.

[6 * 5 Marks]
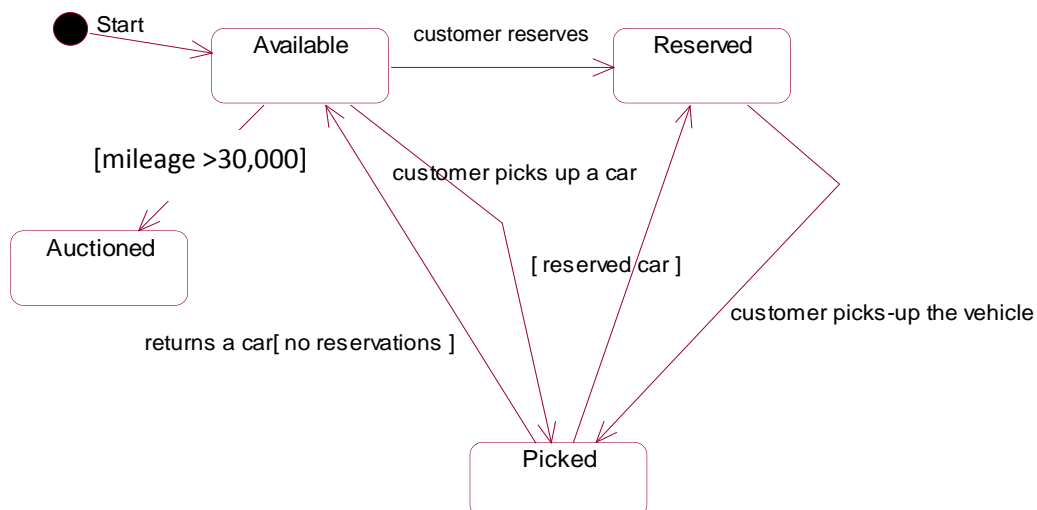
(i) This UML diagram is an example for a   **State Diagram**

(ii) **Customer Reserves** is an example of a state transition in the above diagram.

(iii) A **Guard** condition allows a state transition only if it is true.

Mileage >30,000 and no reservations are two examples for such conditions in the above diagram.

(iv) "Available" is the **state** of the object when it is created.

c) Define each of the following object oriented concepts.
   (i) Inheritance

ANSWER IN THIS BOX

inheritance is defined as a mechanism by which more specific classes (called subclasses or derived classes) incorporate structure and behaviour of the more general classes (called superclasses or base classes).

(10 Marks)

(ii) Encapsulation

ANSWER IN THIS BOX

Packaging of several items together into one unit (both attributes and behaviour of the object), Also protects the contents.

(10 Marks)

(iii) Polymorphism

ANSWER IN THIS BOX

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Polymorphism means the ability to take multiple forms. In an object-oriented paradigm, polymorphism implies using operations in different ways, depending upon the instance they are operating upon.

(10 Marks)

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