



UNIVERSITY OF COLOMBO, SRI LANKA



UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2008/2009 – 2nd Year Examination – Semester 3

IT3103: Object Oriented Analysis and Design
PART 2 – Structured Question Paper

21st March, 2009
(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 06 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.

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

- 1) Based on the following case study answer question 1.

Apartment Rental System

Case Study

‘Dream Apartments’ is a company that provides an apartment leasing service to locals and foreigners. This company owns multi-storied buildings containing apartments and in different locations within the Colombo city. Each building contains a number of apartments belonging to one of the following apartment classes:

- Class1 – one bed roomed apartment, one common bathroom
- Class2 – two bed-roomed apartment , one attached bathroom, common bathroom
- Class 3 – three bed-roomed apartment, two attached bathrooms, common bathroom
- Suite – apartment with 4 bedrooms and a servants’ room, 3 attached bathrooms, one common bathroom and a servants’ toilet

Each apartment contains a living and dining area, self contained kitchen/pantry unit, a laundry area balcony, telephone connection, broadband Internet connection and cable TV connection . For each apartment, a parking space for a single vehicle is provided by default. If available, additional parking space can be reserved for an apartment for a fee. A gymnasium, and a swimming pool common for all occupants are also available.

Each apartment building is identified by a *building id* and each apartment within the building is given a unique *apartment number*. Parking spaces are also identified using different *ids*.

Vacant/available apartment can be occupied after entering into a lease agreement with the company for a specified period of time. A refundable deposit and the first month’s rent should be paid in advance when signing the agreement. The person who has leased an apartment (known as the chief occupant) should provide the name, alternate address, NIC/Passport no, emergency contact details and details of each dependant who would occupy the apartment including servants. The relationship between the dependants and the chief occupier is also recorded. Details of the lease agreement are also kept by the company.

Two months before the lease expiry date, the occupant can make a lease extension request to the company. Upon approval by the manger, a fresh lease agreement can be entered into, provided that the occupant agrees to the revised deposit amount (if any) and the rent that is applicable at the time. Upon lease expiration, the occupant should vacate the apartment and the refundable deposit is reimbursed by the company after deducting any dues.

At a given point of time, an apartment can be in one of the several states such as available, occupied by an occupant, unavailable (made unavailable by the management or due to prolonged maintenance requirements), or reserved by a person. It should be noted that it is possible to reserve an apartment that is available, being maintained or occupied (provided that there is no lease extension request for the apartment and the lease expiration occurs in less than thirty days to the reservation date).

Any person who wishes to lease an apartment can make an inquiry from the clerk in the main office about the availability of an apartment. The clerk is able to provide information on the locations of the available apartments and different apartment classes. She also can provide information about the number of rooms, floor area, applicable rent, applicable deposit amount, maximum number of occupants allowed, applicable reservation fee etc. of each class.

If a person knows his/her requirements in leasing an apartment, the clerk can check the availability of the apartment after obtaining the relevant information such as required location, apartment class, the required date of occupation etc. If an apartment satisfying his/her requirements is available, the person can make a reservation by paying a non refundable reservation fee that is applicable at that point of time and enter into a lease agreement with the company.

If an apartment satisfying his requirements is unavailable, the person can make an application free of charge and he will be in a waiting list. The clerk will obtain the necessary details such as the location of the apartment building, apartment class, the required date for occupation etc. Applications are served on First-Come –First-Served basis (application queue) and once an apartment that caters to the application requirements becomes available, the first applicant in the queue is informed. Applicant can make a reservation and enter into a lease agreement with the company.

- (a) For the above case study, Office clerk can be identified as one of the *Actors*. Identify the relevant Use cases for the Office Clerk.

ANSWER IN THIS BOX

Use cases: Manage inquiry, Check availability of Apartments, Make Reservation, Extend Apartment lease, Update apartment details, Make unavailable, Lease an apartment

(20 Marks)

- (b) Identify five(5) potential classes for the above system.

ANSWER IN THIS BOX

Building, Location, Apartment, Apartment class, Lease, Occupant, Reservation, Application form, Lease extend details

(20 Marks)

- (c) Identify a pair of classes where a composition relationship exists. Draw the relationship using UML notation and indicate the multiplicity.

ANSWER IN THIS BOX



(20 Marks)

- (d) Name an object with multiple states.

ANSWER IN THIS BOX

Apartment

(10 Marks)

- (e) List five (5) different states of the object identified in 1(d).

ANSWER IN THIS BOX

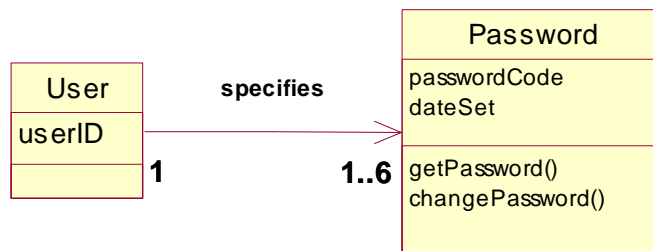
Available/ Vacant
 Occupied
 Reserved
 Occupied- Reserved
 Maintained-Reserved
 Unavailable
 Maintained

(30 Marks)

(2)

- (a) Imagine a system where a user must change his password every 30 days. When the password is changed, the new password cannot be one that he has used for the past six months. User's current password should be kept for authentication purposes or to change the current password. It would not make sense that for a given password, one would want to identify the corresponding user. Complete the model diagram given below to illustrate the scenario. You need to include the relationship and the multiplicity.

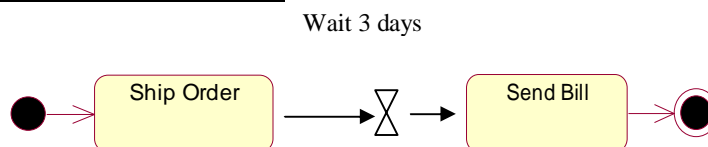
ANSWER IN THIS BOX



(30 marks)

- (b) Consider Ship Order and Send Bill as two activities in a system. You may need to wait for 3 days after shipping an order to send a bill. Model the above scenario using a UML 2.0 Activity diagram.

ANSWER IN THIS BOX



(20 marks)

(c) Draw the symbols used in UML 2.0 to represent the following:

- (i) Exception activity
- (ii) Action invoking another activity

ANSWER IN THIS BOX

(i)



(ii)



(10 marks)

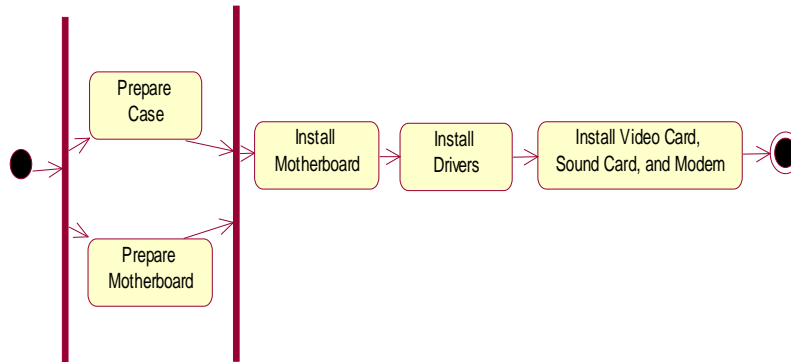
(d) Consider a computer assembly workflow that involves the following steps:

- (i) Prepare the case,
- (ii) Prepare the motherboard,
- (iii) Install the motherboard,
- (iv) Install the drives,
- (v) Install the video card, sound card and modem.

Suppose the entire workflow can be sped up by preparing the case and the motherboard at the same time since these actions do not depend on each other.

Draw an activity diagram to represent the above workflow.

ANSWER IN THIS BOX



(40 Marks)
