



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2013/2014 – 2nd Year Examination – Semester 3

IT3104: Object Oriented Analysis and Design
PART 2 – Structured Question Paper

1st March, 2014
(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 **10 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 (x), (e.g. ☐) 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:		

Case Study

An on-line shopping mall requires the implementation of shopping cart functionality. Following is a description of the requirements.

Users should be able to browse items on-line and add them to the shopping cart. There need to be the possibility to view browsed items where a more detailed description of the product is shown.

Even an unregistered user can add items to the shopping cart and proceed to check out the items (complete transaction), but user need to be authenticated by the system and therefore registration is mandatory at this point. To register, the users need to provide a unique login-id, First Name and Last Name, valid e-mail address and a password and there by an account is created for the user. It is essential to ensure that the password passes the required strength test. A 'new' user will be created in the system and an e-mail will be sent to the given e-mail address with a system generated verification code and the new user need to enter that verification code into the system in order to activate his account. User information together with registration information should be maintained in the system. System will make a user account 'Suspended' temporarily for one hour upon three login failures and after one hour the user account is automatically made 'Active'. If a particular user has not performed any activity on the web site for one year then that users' account will be suspended by the system too. In both cases the users have the facility to resume the suspended account by following the instructions provided and make the user account 'Active'. A user account may be 'Banned' upon any illegal activity.

Registered users will be able to log-in to the system and based on their browsing history, system need to be able to provide them with a list of recommended products by way of a link called 'View Recommended Items'. Pre-requisite for this is that the user is successfully authenticated.

At the time of registration, users can add their billing address and one or more shipping addresses to the system. The billing address must match with the credit card billing address if they plan to purchase the items via credit card payment.

Details of products need to be maintained and each product can belong to one or more product categories such as 'Electronics', 'Computer Peripherals', 'Electrical Appliances' etc. Current sale price of the product is also maintained.

A user will have one shopping cart per browser session and all the items added to the cart in that session will be associated with the cart. It should be possible to edit/delete the added items. When user proceeds to check-out existing users need to log in (if not already logged-on) or new users need to register as mentioned before. System will calculate the total amount based on the cart items. Tax and shipping cost also will be added to the total amount. Payment information needs to be entered to the system where the user has the option of paying by either credit card or using 'PayPal'. Shipping address need to be entered as well. It would be easier for the users if they have maintained their billing and shipping addresses in the system and there should be provision for easy retrieval of this information. The system should provide the facility to add/edit address information for registered users as well. A 'preliminary' order is created and upon verification of the payment information, the order is 'confirmed'. All items checked-out are included in the order and a copy of the order is e-mailed to the user's e-mail address. An order knows when the order has been 'shipped' and also when the items are 'delivered' to the user. When the order is shipped user need to be notified via e-mail.

It is not needed to consider implementation details such as Session management; Security etc and only domain modelling is required.

Based on the above case study answer question 1.

- 1) (a) Identify the actor(s) in the above system.

(10 Marks)

ANSWER IN THIS BOX

Registered Customer, Unregistered Customer, Credit card payment service, Paypal

- (b) Consider the following description about checkout scenario.

In checking out first the user needs to be logged on to the system (Authenticated). If not user should be prompted to log on or register with the system. User has the option of viewing and updating the shopping cart and accordingly the total amount need to be re-calculated. Next the shipping cost and the amount of applicable taxes need to be calculated. The payment method needs to be specified and depending on that, the external actors Credit card Payment Service or Paypal Payment service will verify the payment details.

- (i) Two external actors involved with checking out the above scenario are *Credit payment service* and *Paypal*.

Identify the other actors involved in this scenario.

(10 Marks)

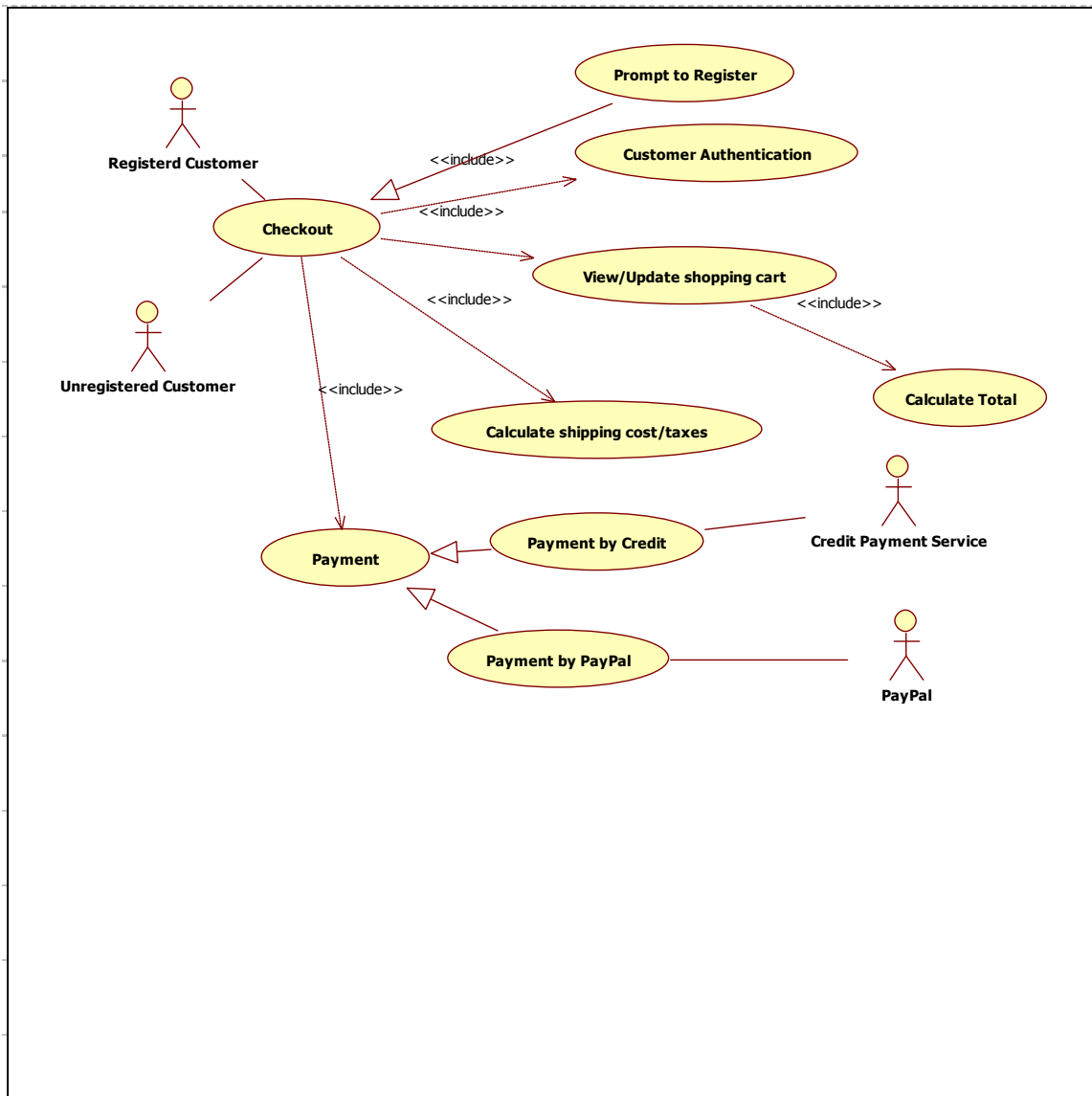
ANSWER IN THIS BOX

Registered Customer, Unregistered Customer

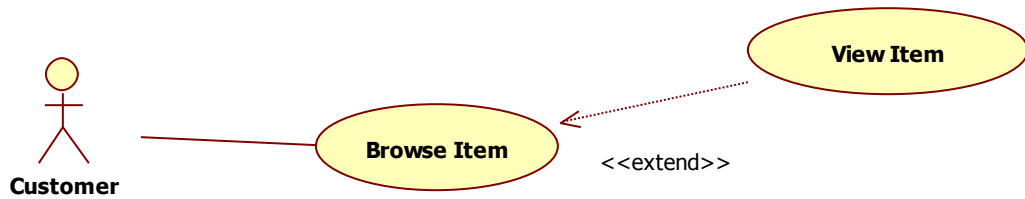
- (ii) If the identified use cases are Checkout, Customer Authentication, View/Update Shopping cart, Calculate Shipping cost and Taxes, Payment, Payment by Credit card and Payment by PayPal draw the use case diagram for the Checkout scenario. Show the relationships.

(30 Marks)

ANSWER IN THIS BOX



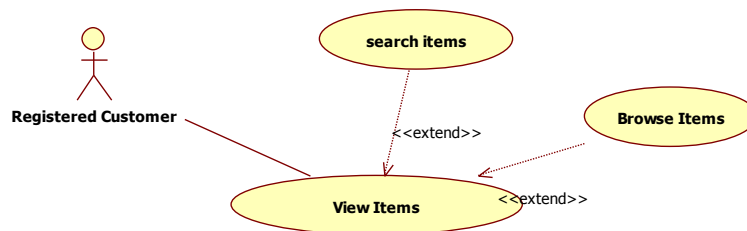
- (c) Users can view items to see more detailed description of an item. They can view an item by browsing. Part of the usecase diagram relevant to browse and view an item is given below.



If the users can view an item by browsing or searching for a particular item, show that requirement by modifying the part of the usecase diagram given above. Indicate correct relations.

(10 Marks)

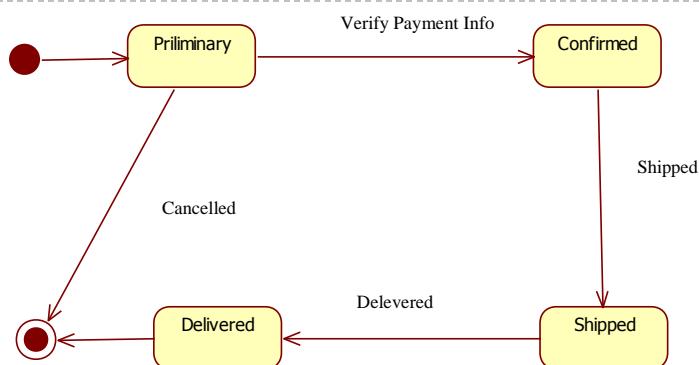
ANSWER IN THIS BOX



- (d) Draw a state chart diagram for Order object.

(10 Marks)

ANSWER IN THIS BOX



(e) Are there any other objects in the system that can be in different states during its lifetime? Name the states for each identified object.

(05 Marks)

ANSWER IN THIS BOX

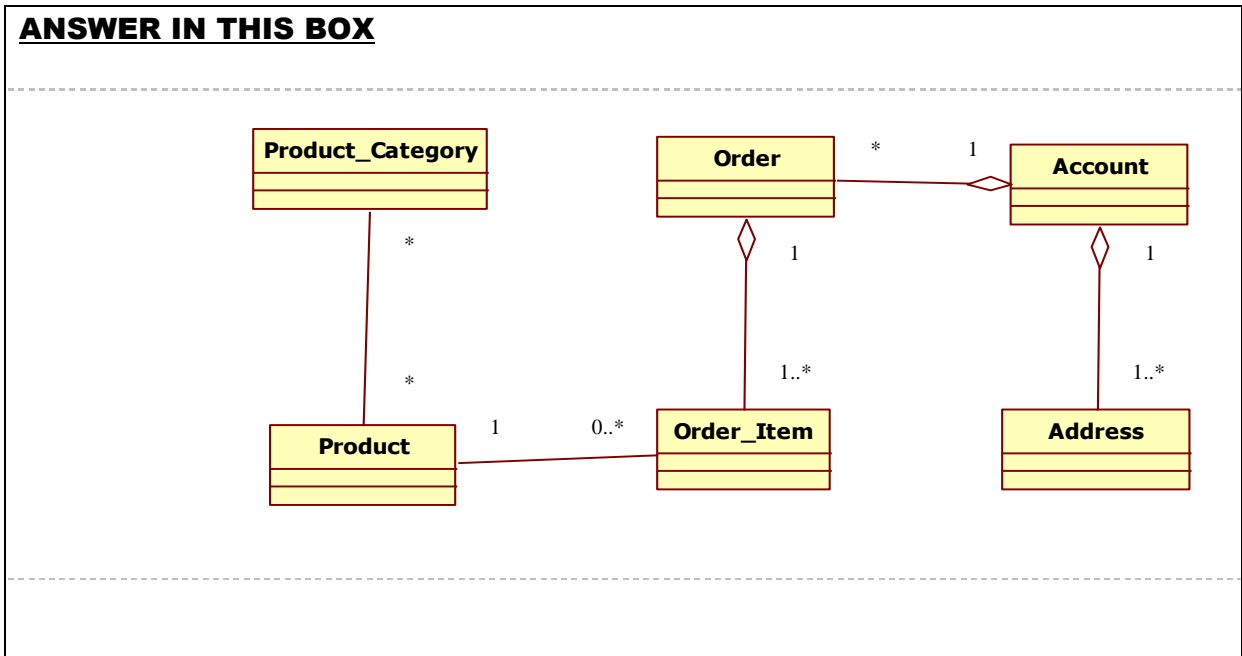
User Account

States: New, Active, Suspended, Banned

(f) For the following subset of identified classes draw Relationships and indicate Multiplicity.

Classes: Product_ Category, Product, Order, Order_Item, Account, Address.

(15 Marks)



(g) Which of the classes has generalization/specialization relationships?

(10 Marks)

ANSWER IN THIS BOX

Superclass: Payment

Subclasses: Paypal, Credit payment

- 2) (a) A *model* is an abstract representation of a system, constructed to understand the system prior to building or modifying it. The following are 3 models designed in Unified Modelling language (UML).

Diagram 1

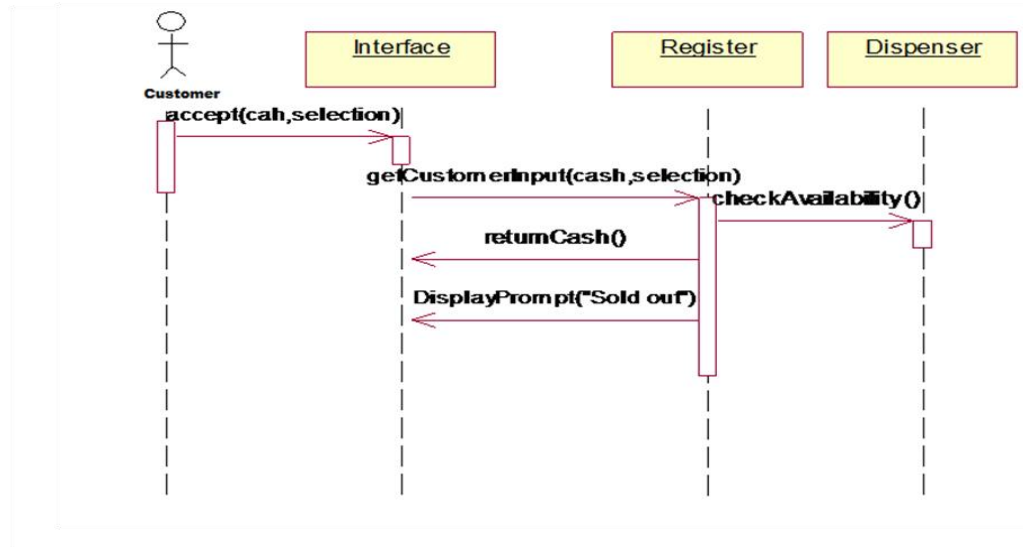


Diagram 2

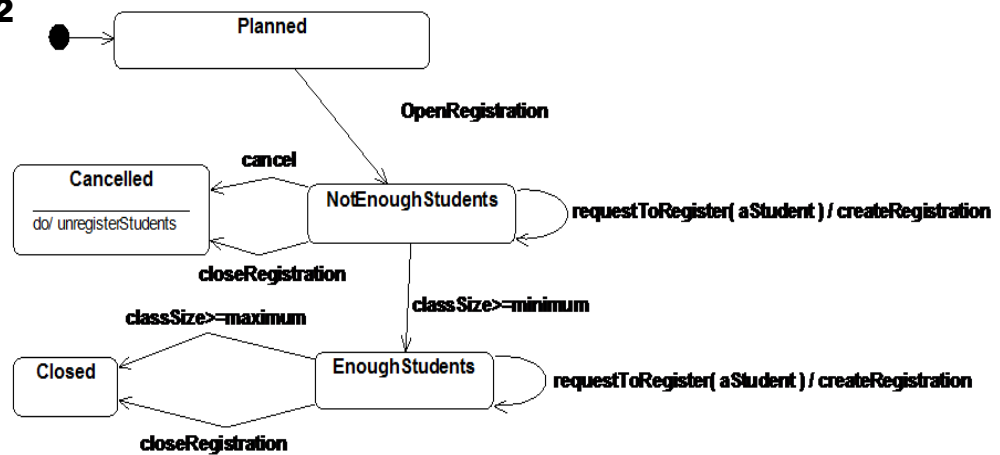
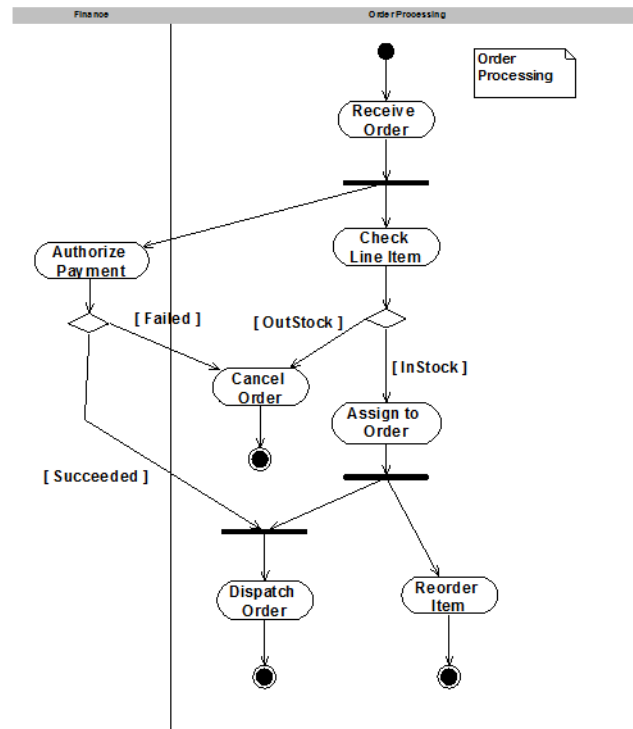


Diagram 3



- (i) A Model can be used to represent either static or dynamic situations. A *static model* can be viewed as a snapshot of a system's parameters at rest or at a specific point in time. In contrast, a *dynamic model* can be viewed as a collection of procedures or behaviors that, taken together to reflect the behavior of a system over time.

Identify the category (Static / Dynamic) to which the above diagrams falls into.

(15 Marks)

ANSWER IN THIS BOX

Diagram 1: Dynamic

Diagram 2: Dynamic

Diagram 3: Dynamic

(ii) Name the above UML diagrams.

(15 Marks)

ANSWER IN THIS BOX

Diagram 1: Sequence Diagram

Diagram 2: State Transition Diagram

Diagram 3: Activity Diagram

(iii) Name 2 UML notations used in each of the diagrams shown above. Provide each an example. One is done for you.

(30 Marks)

ANSWER IN THIS BOX

Diagram 1:

e.g Object - Customer

i. Object Lifeline- Customer

ii. Messages - accept

Diagram 2:

iii. State - Planned

iv. Transition - OpenRegistration

Diagram 3:

i. Activity – Authorized Payment

ii. Transition - Outstock

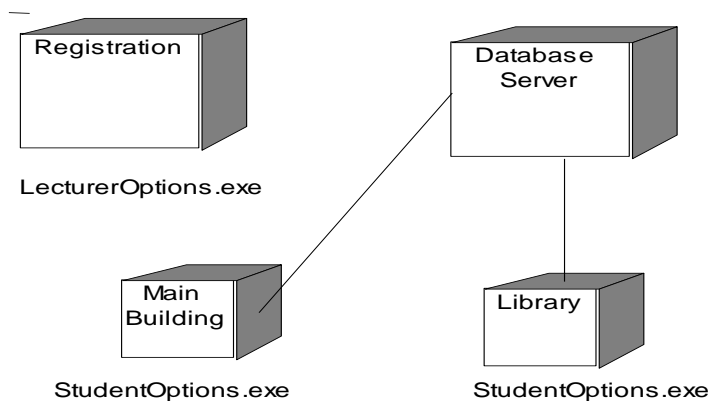
- (b) Both Component and deployment diagrams are known as implementation type diagrams.
- (i) What is the main difference between these two diagrams?

(10 Marks)

ANSWER IN THIS BOX

Component diagrams are used to show only the physical architecture of the software of the system whereas deployment diagrams are used to describe the physical architecture of both hardware and software of the system.

- (ii) Consider the following diagram and identify whether it is an example for a component or a deployment diagram?



(10 Marks)

ANSWER IN THIS BOX

Deployment

- (iii) Identify the nodes in the example given in part (ii).

(20 Marks)

ANSWER IN THIS BOX

Registration

Database server

Main Building

Library
