UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2018 – 2nd Year Examination – Semester 3

IT3105: Object Oriented Analysis and Design

PART 2 – Structured Question Paper

12th May 2018
(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 (×), (e.g. [X]) the numbers of the questions answered.

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

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

ABC Company is planning to start up an online store which sells Books & Blu-Ray Movies. They are planning to set up a computerized system and simplified preliminary domain requirements summary is as follows:

Registration with the system

The customers if they wish can register with the system by creating a user account. Information required for registration is username, password, date of birth and a valid e-mail address together with their first name and last name. Optionally they can enter their billing address and shipping address as well while registering with the system even though it is possible to do so after registration as well. Upon successful registration a new user is created and the system should send an activation code to the e-mail address provided. User will have to enter this code at the first-time login to the system to make the user active.

Username and password has to be specified when login into the system. System should validate the login information provided and display appropriate error messages. If user fails to enter correct information within three attempts, the user needs to be locked for 10 minutes and informed via e-mail. After 10 minutes, account should become active again.

Customer can request to close the user account if required. Administrators can close a user account for violation of system policies as well. Managing the user account should be possible enabling the user to change their password and address information.

It is possible for unregistered users to browse the system and view product details.

Administration Users can only be created using a separate flow which is not visible to ordinary users. Administration users can log on to the system to do administration functions such as adding, modifying, removing products, setting product prices etc.

Browsing/Searching Products

Customers should be able to browse a list of products (i.e. Books and Blu rays). When a listed product is selected, details about the product need to be displayed. It should be possible to search for products using key words such as title, author for books and Movie title for Blu-Rays. Advanced searching facility should be there for customers if required, where more searching attributes are available. When a customer clicks on a search result, details of the product need to be displayed.

Wish List

Wish list can only be created by the registered customers and they should be logged on to the system to do so. While browsing/Searching, customers should be able to add products they find interesting, to the wish list. The items added to the wish list need to be persistently stored so that the wish list is available on next log on. Managing the wish list is totally up to the customers and they should be able to add, remove products from it as they wish. When the user logs on to the system, they should be able to browse and view products previously added to the wish list.

Shopping cart

A logged on customer can add any number of products to the shopping cart while browsing or from the wish list. It should be possible to view the shopping cart, remove items from it at any time. Shopping cart information need not prevail after the closure of the browser window. When the user is ready, he/she can proceed to check out the shopping cart.

Checkout Shopping Cart

Customer needs to be logged on to the system to perform this action
When the checkout option is selected, products in the shopping cart need to be displayed to the customer where he/she can alter the default quantities (i.e. one) of each product if required. Total price for the products in the cart need to be displayed as well.
Customers should be able remove items from the cart and go back and add more items. Total price should be updated with these alterations

Placing Orders

Customer needs to be logged on to the system to perform this action
Customers can place orders based on the products in the shopping cart while in the checkout process. The shipping address should be displayed (if provided at registration) and if he/she wants to ship to a different address, then entering a different address should also be possible. Shipping charges for the order is also displayed and added to the total order amount. Shipping charges are obtained from Courier Service system.

Payment for the order

Payments for orders can be done via credit card or using PayPal account. Payments are handled by a separate accounting module and need not be considered. The payment information is transferred to the accounting module and information provided by accounting module can be received by the system

Order Confirmation

Once the order is successfully placed, a confirmation e-mail and an invoice need to be sent to the user's e-mail address.

Delivery

Products, ordered will be delivered to customers by external courier service. The system will interact with the courier Service system to keep track of the delivery.

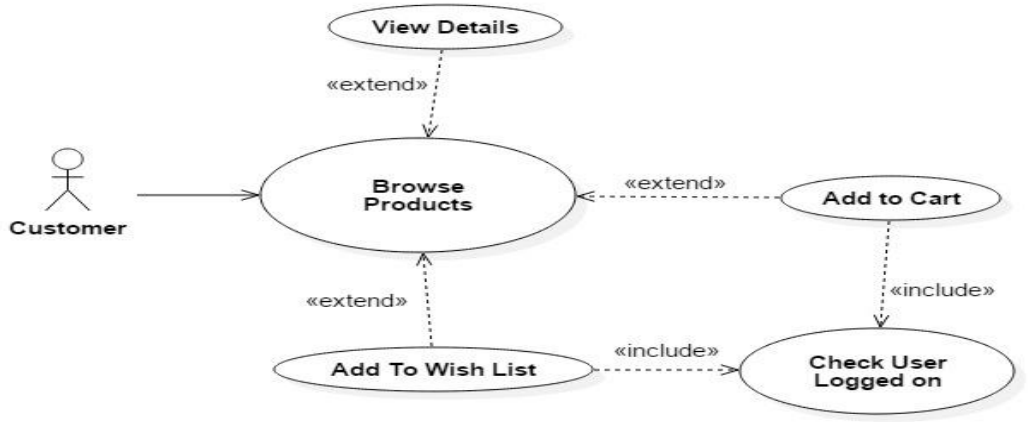
Order Status

Registered Customers can view their order status any time after placing the order by using the system. Order will be created as new and other connected systems will send information whenever something new happens to the order. The information such as whether the order is being Processed, Packed, Dispatched, delivered, and closed are important for customers.

a) (i) The following use case diagram models the "Browse products" scenario. Complete the diagram by identifying the relationships. Clearly indicate the stereo types <<include>> and <<extend>>.

(20 Marks)

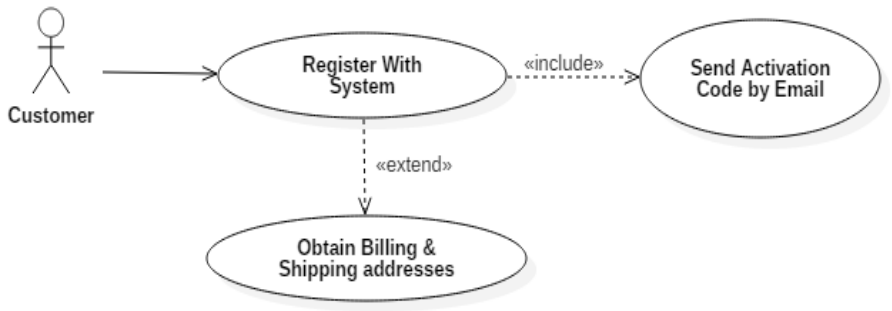
ANSWER IN THIS BOX



(ii) The following use case diagram models the scenario "Register with the system" where a customer attempts to register with the system. Complete the diagram by indicating clearly the relationships and stereo types (Hint: <<include>> and <<extend>>).

(10 Marks)

ANSWER IN THIS BOX



(ii) Identify the actors involved in "Place Order" Scenario.

(3 Marks)

ANSWER IN THIS BOX

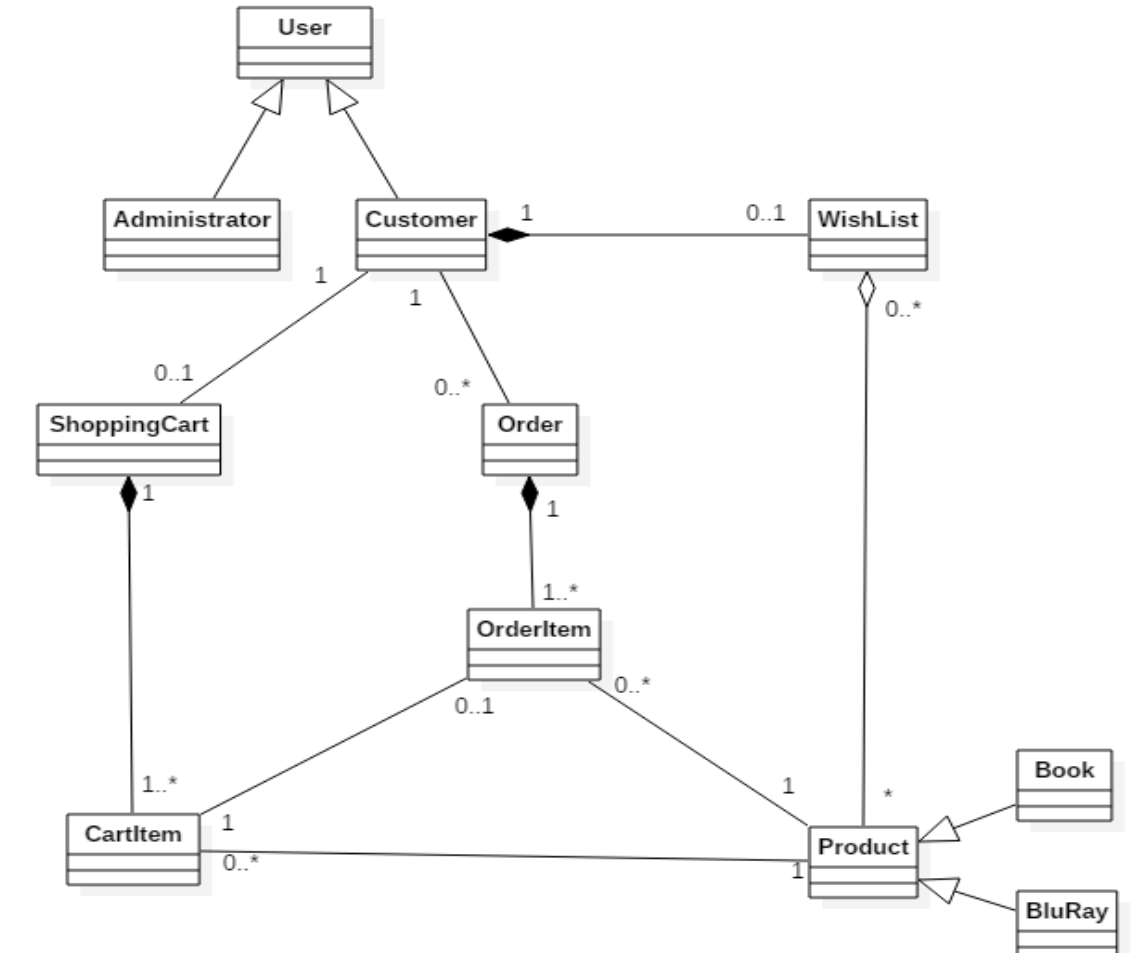
Customer, Accounting Module, courier Service System

b) (i) Draw the relationships between the classes given below using UML notation.
(ii) Indicate the multiplicities appropriately.

(Hint: Relationship types may be generalization/specialization, aggregation, composition, or association)

(35 Marks)

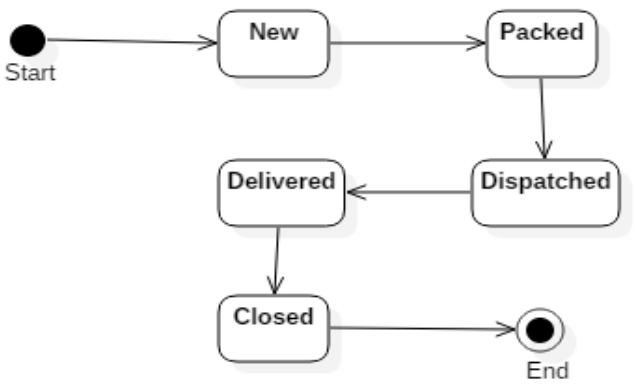
ANSWER IN THIS BOX



c) Draw a state chart diagram for the class "Order".

(06 Marks)

ANSWER IN THIS BOX



d) The class "user" undergoes five (5) state changes. Complete the following table by identifying correct states and trigger conditions. Use the example as a guide.

(12 Marks)

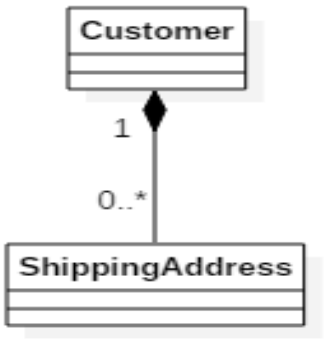
ANSWER IN THIS BOX

Current State	New State	Trigger Condition
Start	***New***	***Unique User Name provided and Register button Clicked***
New	Active	Valid Activation Code Entered
Active	Locked	Incorrect Login information 3 times
Locked	Active	10 minutes passed
Active	Closed	User Request or System Policy Violation

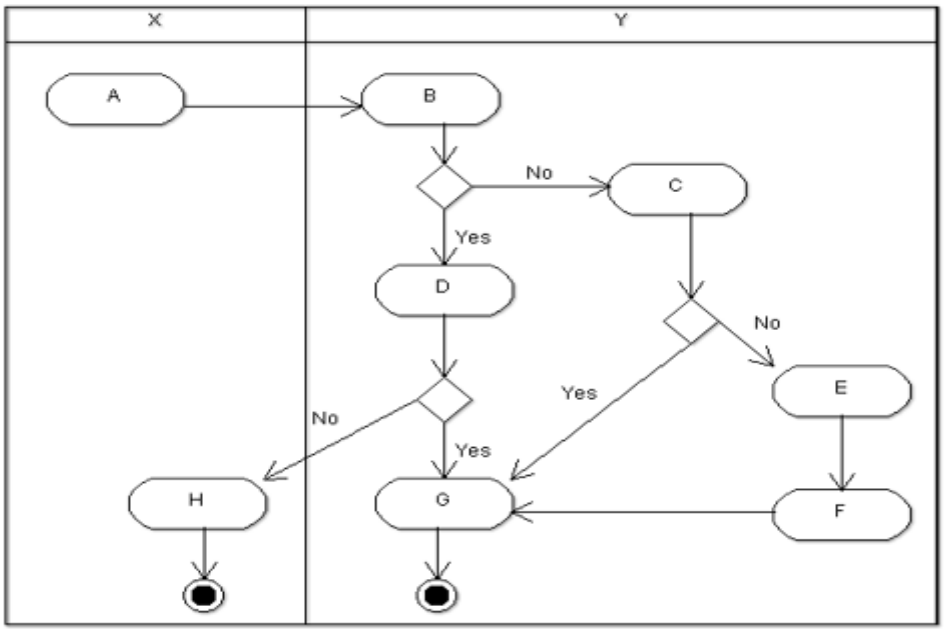
e) A customer should be able to add and store multiple shipping addresses. When an order is placed, all the addresses will be visible so that the customer can select one of them. How can this new functionality be accommodated in the above class diagram? Draw the UML diagram showing the required classes, relationships and multiplicities.

(14 Marks)

ANSWER IN THIS BOX



2. a) Consider the following diagram.



Answer the subparts from (i) to (v) based on the above diagram by **underlining** whether the statement is TRUE or FALSE. In case of FALSE statements, write the correct statement in the space provided.

(20 Marks)

i. The above diagram is an example of a component diagram.

ANSWER IN THIS BOX
TRUE / **FALSE**
This is an example of an activity diagram.

ii. In the diagram, "X" and "Y" denote the objects.

ANSWER IN THIS BOX
TRUE / **FALSE**
X and Y are the swim lanes.

iii. The diagram illustrates the static view of the system.

ANSWER IN THIS BOX
TRUE / **FALSE**
This diagram illustrates the dynamic view of the system

iv. The diagram includes ‘decision points’, ‘merge points’ and ‘synchronization bars’

ANSWER IN THIS BOX
TRUE / **FALSE**
This diagram includes only decision points

v. This type of diagrams can have more than one ending point as illustrated.

ANSWER IN THIS BOX
TRUE / FALSE

(b) . Consider the following use case narration which describes the scenario of a specially designed telephone box used to take telephone calls using a credit card.

Use Case Name :	Take a telephone call using the credit card
Participant:	User Credit card processing center
Entry Conditions:	User has a valid credit card Credit balance should be sufficient for the minimum amount required to take a phone call.
Exit Conditions:	User hangs the receiver Credit card is returned to the user

Flow of Events:

1. The user inserts the credit card.
2. Telephone box sends the message to the card center.
3. Card center processes the card.
4. Card center sends the available credit to the Telephone box.
5. Telephone box processes the available balance.
6. Telephone box shows a message for the user to pick up the receiver.
7. User picks up the receiver.
8. Telephone box displays the number pad to the user on the screen.
9. User dials the number and makes the phone call.
10. Telephone box processes the duration/amount.
11. User ends the phone call by pressing the 'END' button / hanging the receiver.
12. Telephone box displays the total phone call duration and the amount.
13. Telephone box sends the amount to the card center.
14. Card center charges the amount from the credit card.
15. Card center sends the confirmation to the telephone box.
16. Telephone box displays the message 'THANK YOU, COME AGAIN".
17. Telephone box ejects the credit card.

Exceptional conditions and alternative flow of events:

When the credit is not sufficient to make a call

5.1 Display error message and Go to 17

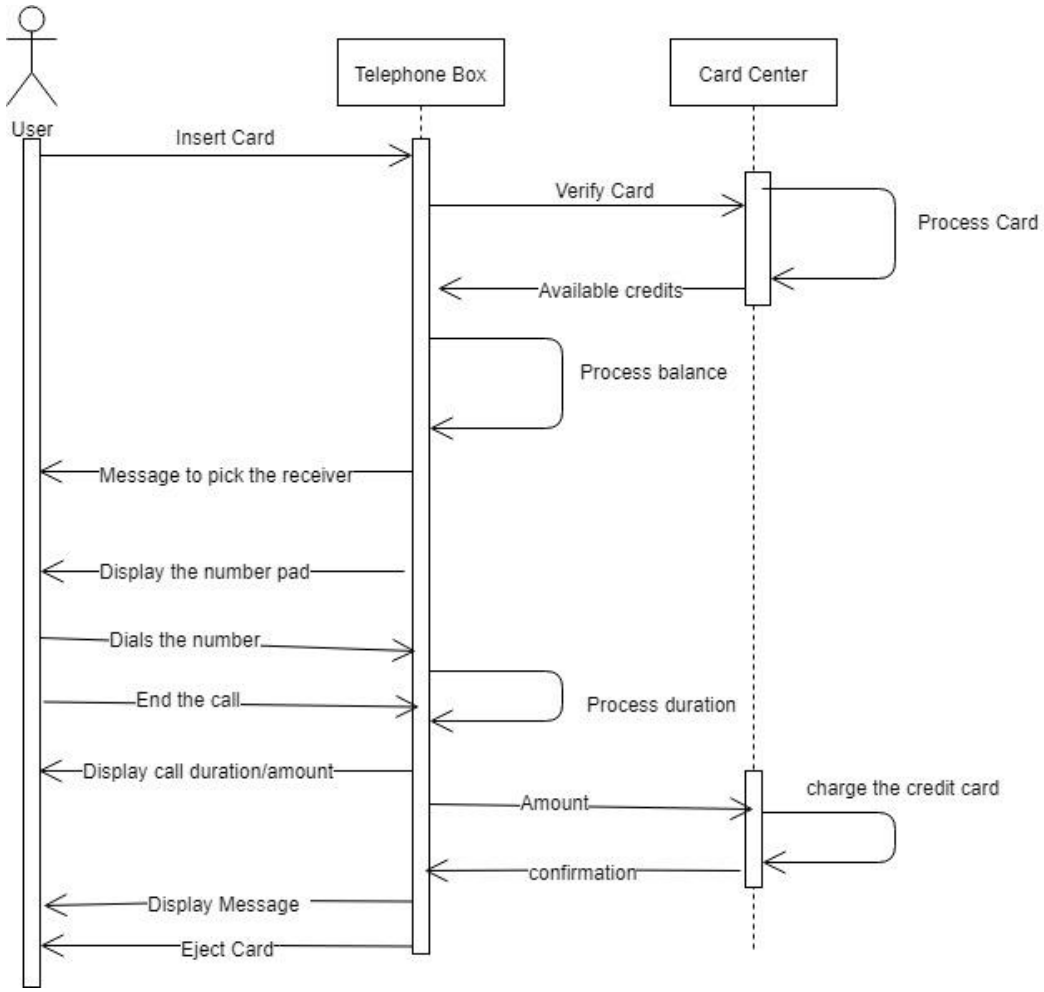
When the amount exceeds the credit card balance

10.1 Ends the phone call and Go to 12

i. Draw a sequence diagram to represent the above scenario.

(40 Marks)

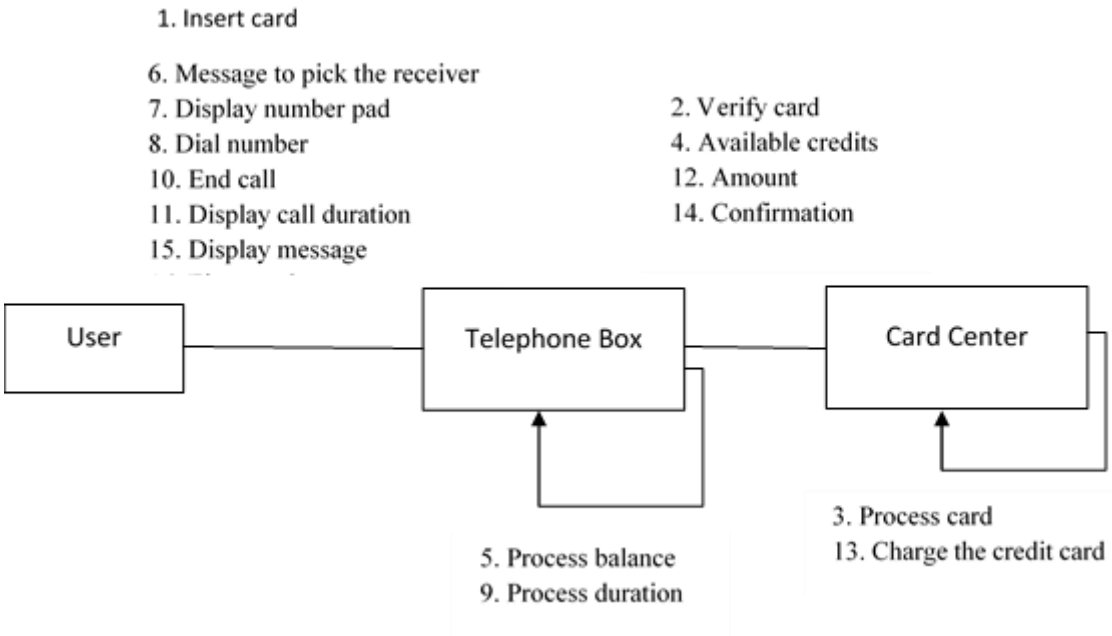
ANSWER IN THIS BOX



ii. Draw the relevant collaboration diagram for the above sequence diagram.

(30 Marks)

ANSWER IN THIS BOX



iii. The following table shows a comparison between sequence diagrams and collaboration diagrams. Complete the following table using the relevant text given on either side of the table.

(10 Marks)

ANSWER IN THIS BOX

Sequence Diagram	Collaboration Diagram
Sequence diagrams are used to examine the behaviour of objects within a single use case.	Collaboration diagrams are used to examine the behaviour of objects within a single use case.
Sequence diagrams are known as Interaction diagrams.	Collaboration diagrams are known as Interaction diagrams.
In a sequence diagram, a set of objects are arranged according to the time sequence.	Collaboration diagram doesn't show object interaction in timely manner.
Sequence diagrams illustrate interactions in two dimensions and each new object is added to the right.	Collaboration diagram has only one dimension and objects are placed anywhere on the diagram.
Clearly show time ordering or sequence of events.	In collaboration diagrams it is difficult to see the sequence of messages.

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