University of Ruhuna - Faculty of Technology

Bachelor of Information & Communication Technology
Level 1 (Semester 2) Examination - April 2019

Course Unit: ICT1223 Object Oriented Analysis & Design (Theory) **Time : 2 ½ hours**

Answer all **five** questions

1.

a. Select the correct answer from the brackets and fill the blanks

(encapsulation, class, low coupling, analyzing, identity, method, high cohesion, instance, designing, abstraction)

i. "*Everything an object knows is expressed by its attributes and everything an object can do is expressed by its list of operations*", this is identified as _____.
ii. The main characteristics of an object are state, behavior and _____.
iii. Object oriented _____ emphasizes defining software objects and how they collaborate to fulfill the requirements.
iv. In object orientation, packaging related data and operations together is called as _____.
v. _____ is a description of a set of objects that share the same attributes, operations, methods and relationships.

b.

i. Name the components of a message which are passed between objects in an object oriented environment?
ii. Briefly explain the object oriented principal, '**Abstraction**'.

c.

i. Write two advantages of using hierarchical arrangements of objects in object orientated analysis and design.
ii. Briefly explain the **disjoint** nature of a hierarchic system.
iii. Transitive operation is a characteristic of generalization. Re-write the inheritance rules by considering the transitive operation.
iv. Briefly explain the **polymorphism** in object orientation.

d.

i. Name two main classifications of Unified Modeling Language (UML) diagrams and briefly explain what are illustrated by those two classifications.

Name three UML diagrams under each classification.

ii. List four best practices of Rational Unified Process (RUP)

iii. Briefly explain the **baseline** in Unified Process

2.

a.

i. State whether each of the following statement is **true** or **false**

1. Primary actor of a use case is an actor who provides a service to the system under discussion
2. Offstage actor of a use case is the one who has an interest in the behavior of the use case
3. 'Scope' field of a use case explains who cares about the use case
4. Use cases are used to record non-functional requirements of a system
5. Usually a use case should be named using the verb-object format
6. Post conditions field of a fully dressed format use case represents alternate scenarios of success or failure

ii. Briefly explain the following characteristics of an action in activity diagrams.

1. Atomic
2. Uninterruptible
3. Instantaneous

b. Read the following passage which describes the use case of 'make hotel reservation', and draw the activity diagram with partitions.

Using the hotel reservation system, customers can book hotel rooms. First, the customer can start the booking process by opening the reservation system. Then the system displays the search form and customer fills the details of check-in date, check-out date, number of adults, number of kids and number of rooms required one after another. After filling those details, customer clicks submit button and system checks the availability of rooms using those details. If the search is unsuccessful, then the system displays the message, "Sorry, no rooms available" and then the customer exits from the system. Otherwise, the system displays a list of available rooms. From that list, customer can select a room if he likes to book a room or exit from the system if he/she does not intend to book anymore. If the customer is willing to book a room, he/she can select a room from the list of rooms and click 'Reserve' button. After that, the system requests for the payment details. Then the customer provides the details and clicks "Pay" button. The system then processes the payment while reserving the requested room. After that system displays the message, "Booking successful" and then the customer can exit from the system.

3.

a. Write **four** steps that are required to follow when defining a use case.

b. Write a fully dressed format use case for the following description of an online course registration.

(**Note**: You should only include the **use case name, primary actor, pre-conditions, post-conditions, main success scenario**, and **extensions (alternate scenarios)** in your fully dressed format use case)

Using the online course registration system, students can register for the courses online. For a successful login of a student, the system displays a list of available courses to register. Then the student selects the preferred courses from the given list and register for those courses. After that, the system sends a mail to the student regarding the registration information. After each successful registration, the system updates the database. If the registration is not opened for the student, the system will display the message "No courses to show" and if the student has already registered for all the available courses, the system will display the message "You have already registered" when the student logs into the system. If the student's mail address is not available in the database, the system requests the email address and the student should provide the email address in order to receive the email.

c. Draw the use case diagram by considering the user level goals of the following scenario.

Using the e-channeling system, the patients can search doctors, make appointments for doctors, cancel appointments and pay bills if an appointment is made. When making an appointment, a receptionist is supporting that process. If the patient is a regular patient, then he/she can check his/her records using the system. A clerk is assigned to support the bill payment process. Additionally, discounts can be included into the bill, by considering the patient's payment method.

4.

a.

i. Define the meaning of 'Multiplicity' in UML class diagrams.

ii. Name four types of access modifiers in UML class diagrams and draw the notation of each modifier.

b. Consider the following description regarding a library management system

Librarian can use the library management system to issue books to the library members. Librarian's login ID and password should be maintained by the system. Librarian can add new members, update existing members, issue books and update book status using the system. The system should maintain the details of the library members, such as full name and member ID. There can be two types of library members as lecturers and students. Lecturers should have staff IDs and students should have student IDs in order to borrow books. Any member of the library can search books, borrow books and return the borrowed books. However, only the lecturers can renew the return date of a borrowed book.

All the books in the library have the title and ISBN number to separately identify them. The books can be issued, removed or checked the availability at any given time (assume all available books are issuable). Librarian maintains a catalog which consists with descriptions of all available books in the library. Catalogs are identified by IDs and contain book details. Catalogs add books, remove books and display all the book details.

Draw the class diagram with attributes and methods by indicating the appropriate multiplicities between classes. **Clearly state any assumptions you made when deciding multiplicities.**

(No need to indicate the accessibility types of the attributes and methods)

5.

a.

i. State whether each of the following statement, is **true** or **false**

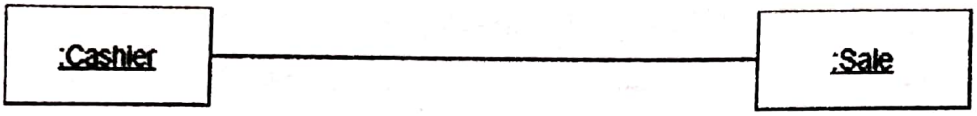
1. Interaction diagrams can be constructed by realizing activity diagrams
2. Communication diagrams illustrate object interactions arranged in time sequence
3. A named instance of a communication diagram can be represented as **s1:Student**
4. Sequence diagrams use links to connect one object with another
5. The activation elements in the sequence diagram are boxes on the lifelines, and indicate that an object is handling a message

ii. Name and briefly explain the following two message types in communication diagrams

1. 

2. 

iii. Consider the following section extracted from a communication diagram.



If the cashier is creating the sale object, then redraw the above diagram to represent the object creation in two different ways using communication diagram notations.

Note: Assume the message number is '**1**'. You are allowed to use appropriate method names to clearly show the differences in two representations.

b. Consider the following main success scenario of a fully dressed format use case

Success scenario:

1. Student inquires the course registration information from the subject clerk
2. Subject clerk provides information regarding the course registration
3. Subject clerk requests for the student's registration information
4. Student provides the information to the clerk
5. Clerk submits the student information to the registrar for validation
6. Registrar validates the information
7. Registrar creates a new database record of the student
8. Registrar sends the approval to the clerk
9. Clerk sends a confirmation mail to the student

Identify objects in the above scenario and construct a sequence diagram to realize the above use case (Clearly show message flows, objects and state any assumptions you made)

********** **-End** **********