MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

SECOND YEAR SECOND SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

MAIN CAMPUS

CIT 210: OBJECT ORIENTED ANALYSIS AND DESIGN

Date: 13th June, 2017 Time: 12.00 - 3.00 pm

INSTRUCTIONS:

- Answer question ONE and any other TWO questions
- Diagrams, where required, should be clearly drawn and labeled
- Use a NEW PAGE FOR EVERY QUESTION attempted, and indicate number on the space provided on the page of the answer sheet.
- Fasten together all loose answer sheets used.
- Mobile phones and PDAs are NOT allowed in the examination room.

CIT 210: OBJECT-ORIENTED ANALYSIS AND DESIGN

Date: June 2017 **Time:** 2 hours

Instructions

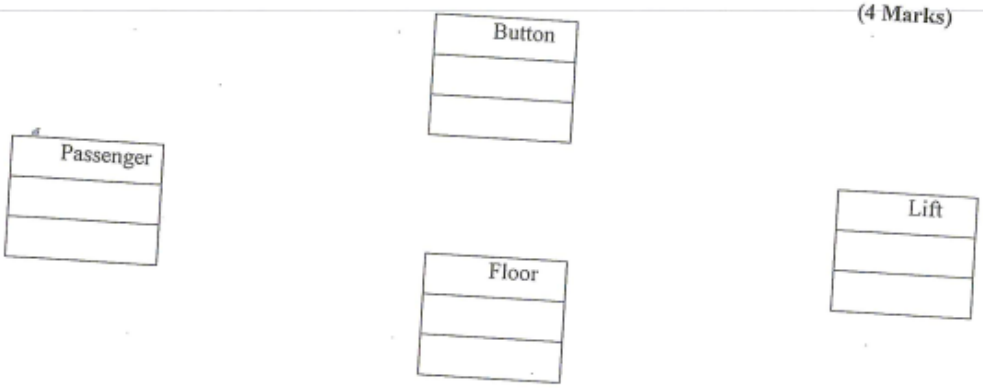
Answer question 1 and any other 2 questions.

Question 1 (30 Marks)

a) State the importance of models in systems development. **(2 Marks)**

b) Describe the following objects in terms of their attributes and operations: *Student and Lecturer.* **(4 Marks)**

c) Consider a lift system serving a tall building with a number of floors. If we model the system with representative classes, draw the class diagram, showing relationship and multiplicity for the following classes. **(4 Marks)**



d) At the beginning of each semester, students may request a course catalogue containing a list of courses offerings for the semester. In addition, Course Catalogue includes information such as professor, department and prerequisites. The new system will allow students to select four course

offerings for the coming semester. In addition, each student will indicate two alternative choices. No course offering will have more than ten students or fewer than three students. The system will cancel the course with fewer than three students. After the registration process, the registration system sends information to the billing system. The billing system will bill the student for the semester. The system will allow professors to indicate the teaching courses and to see the students signed up for the courses. For each semester, students can change the schedule during a period of time.

Students will access the system during this time to add or drop course.

i. Identify the actors that will simulate this system **(2 Marks)**

ii. Identify the uses cases within this system **(5 Marks)**

iii. Draw a use case diagram for the above system **(8 Marks)**

iv. Assuming one of the use case is "Request a course catalogue" write the sunny-day scenario (inform of a UML sequence diagram) **(5 Marks)**

Question 2 (20 Marks)

a) Meru University would like to start a **Meru University Car Rental Information System** for some of its staff members for several academic related trips during the year. The problem domain is an Information System for the Meru Car Rental Centre.

The following are the details and assumptions of the same:

- It is a stand-alone centre, not part of a large organization
- Rents only cars, not any other vehicles or items
- A "car" can be in any capacity: 4-whel, saloons and so on
- The Rental charge may vary by capacity E.g. Hummer rentals are more expensive than Toyota saloons
- The centre does not sell anything
- All transactions are rentals
- The input medium by which membership and car rentals are captured is not important
- cash-only payments
- On completion of a rental, the customer receives a transaction report with "typical" information
- Each renter has a separate membership

i. Identify at least FOUR **primary use-cases** and related **actors**. Draw the results in a UML use case diagram for a *Car Rental Information System.* **(4 Marks)**

ii. Bounded by the *Rent Cars use-case* diagram in (i) above, create a partial domain model and illustrate it in UML notation format showing the concepts, associations and attributes where applicable **(12 Marks)**

iii. Bounded by the *Rent Cars use-case* diagram in (i) above, create a System Sequence Diagram (SSD) in the UML notation. Show actors and system events. **(4 Marks)**

Question 3 (20 Marks)

a) Consider the following tasks performed by a staff in the pet shop:

- *addNewItem():* a staff member creates a new item's record for the item by specifying information about the item
- *deleteItem()*: a staff member deletes an existing item's record
- *checkItem()*: a staff member checks an existing item's record
- *updateItem()*: a staff member orders a certain amount of a particular item.
- *handlePurchase()*: a staff member handles the purchase for a customer

  This action involves:

  - *checkItem()*: e.g. checks the item's amount and price.
  - *updateItem()*: e.g. updates the item's amount remaining in store.

    In the case where a requested item is unavailable, the staff may perform:

    - *orderItem()*: e.g. order a particular item to restock.

Required: Draw TWO equivalent interaction (**sequence and collaboration**) diagrams to represent the scenario as per tasks performed by the member of staff in the Pet Shop. **(20 Marks)**

Question 4 (20 Marks)

a) What is the difference between the object oriented analysis and object oriented design? **(3 Marks)**

b) Highlight two fundamental differences between object oriented analysis and design and structured analysis and design **(2 Marks)**

c) Briefly discuss the impact that object-oriented analysis and design techniques have had on each of the following aspects of software engineering, clearly justifying your position/view:

i. Maintainability and Resilience **(2 Marks)**

ii. Correctness and Robustness **(2 Marks)**

d) Using a well labeled diagram, illustrate the components of a UML class diagram using any data of your choice (Must have at least three classes) **(6 Marks)**

e) Outline five basic steps/activities that one would normally follow in carrying out an object oriented analysis of a medium-sized software project. **(5 Marks)**

Question 5 (20 Marks)

a) **LightWing Ltd**, a small airline charter company based in Wilson Airport, Nairobi wishes to build a new ticket reservation system. Their IT Manager is impressed with what he has heard about object oriented analysis and design techniques. They have hired you, an experienced Systems Analyst in object oriented technology, to carry out a detailed analysis of the new system. The IT Manager has supplied you with a detailed Terms of Reference document listing the following requirements for the proposed system:

- Should have an online (web) interface to allow prospective customers to register and once registered, be able to get quotations based on their travel details, select and pay for tickets and reschedule (within certain limits) their flights.
- Should have an online (web) administration interface to allow an administrator to login, view various reports on available flights, reservations, rescheduled flights, full flights and waiting lists.
- Should be able to send email and SMS (short message service) message alerts to relevant company staff (administrators) on full flights and cancelled or delayed flights.

You are required to develop a first-cut analysis as well as initial design for the above airline reservation system using object oriented analysis and design with UML (Unified Modeling Language) while noting the footnotes below.

Specifically,

i. Draw a UML Use Case Diagram for the main use cases for the proposed solution. **(6 Marks)**

ii. Draw a well-labeled Sequence Diagram to illustrate the order of events/messages when a user is making a reservation from requesting a quotation to making payment. **(6 Marks)**

iii. Construct a subset of a detailed UML Class Diagram, illustrating design details to potentially implement two possible objects: customer and reservation **(6 Marks)**

iv. Outline two advantages of object oriented design that the IT Manager may have had in mind. **(2 Marks)**