

KENYA METHODIST UNIVERSITY

END OF TRIMESTER EXAM APRIL 2008

FACULTY : SCIENCE AND SOCIAL STUDIES
DEPARTMENT : COMPUTER INFORMATION SCIENCE
COURSE CODE : COMP 442
COURSE TITLE : OBJECT ORIENTED SYSTEMS

Total Marks (60)

TIME: 2 ½ HOURS

Instructions

Answer all questions in SECTION A and ANY ONE question in SECTION B

SECTION A – Answer all questions (30 marks)

1. Define the following terms:
 - a. Prototype (3 marks)
 - b. Requirements (2 marks)
 - c. Interoperability (5 marks)
2. Why do requirements drift once a project is underway? (2 marks)
3. Describe how a class to be stored in a database is mapped onto tables. (5 marks)
4. Every student at KEMU can be a member of none or many clubs. Each club must have at least one student as a member. Each club must have at least three club officials and just one chairperson. Each club official can also be an official of any other club(s). Draw a class diagram and show at least one attribute for each class. (7 marks)
5. What are the reasons for using object-oriented design phase instead of moving directly from analysis to implementation? (3 marks)
6. Distinguish between composition and aggregation in terms of their characteristics and notation. (6 marks)
7. Contrast the following terms:
 - a. Actors, Use case
 - b. Parameterized classes, Non-parameterized classes. (4 marks)

SECTION B – Answer ANY ONE question

Question 1 – 30 marks

1. A company has a number of employees. The attributes of the employees include employeeID(primary key), name, address and birthDate. The company also has several

projects. Attributes of project include ProjName and StartDate. Each employee may be assigned to one or more projects, or may not be assigned to a project. A project must have at least one employee assigned, and may have any number of employees assigned. An employee's billing rate may vary by project and the company wishes to record the applicable billing rate for each employee when assigned to a particular project. At the end of each month, the company mails a cheque to each employee who has worked on a project during that month. The cheque amount is based on the billing rate and the hours logged for each project assigned to the employee.

- a. Draw a class diagram, showing the relevant classes, attributes, operations and relationships for the above situation. (15 marks)
- b. Define a C++/JAVA class to implement the UML diagram derived in a.). This should be a simple **working** program that captures all elements of the situation given. (15 marks)

Question 2 – 30 marks

1. Assume you were part of a team to automate KEMU's class timetabling system. The description of the proposed system is given as below:

The new class timetabling system is aimed at minimizing timetable class clashing while maximizing the resources of the university in a minimal amount of time. The system should be implemented to run on the university LAN and each KEMU member should use their login ID and password to access the system; in case the user login details are wrong, the system should indicate to the user an error message. The system should be online 24 hours a day. A user should also be able to print or save the timetable to an external disk such as a flash drive. The system should be able to indicate an error message if the specified printer or disk is not found.

The actions that the users can perform include:

- *Querying the times that a class is.*
- *Querying the room that a class is in.*
- *Free times at a particular day or period.*
- *Free rooms at a particular day or period.*
- *Query the number of classes taking place at a particular time.*

Any of these queries should return either a positive or a negative response, for example, there may be no free rooms for the period of time the user specified.

The class timetabling system should be updated only by the timetable master. Other users should not be able to make any changes to the timetable. The timetabling master can update the timetable by inputting new data or modifying existing data. The system should display an alert if data has been input or modified but no update has been called to be done on the timetable. While updating or modifying the timetabling, there might be some conflicting data required for the timetable to be scheduled properly, for example, when two

instances of the room AD2 have been entered. The system should be able to display an alert when this happens.

- a. Name ALL functional, non-functional requirements (including constraints and assumptions) that you can derive for this system, given the above information. (10 marks)
- b. Draw a use case diagram for the above scenario, giving all inclusions and extensions. (20 marks)

Question 3 – 30 marks

1. Consider the following Elevator problem.

A product is to be installed to control elevators in a building with m floors. The problem concerns the logic required to move elevators between floors according to the following constraints:

- o *Each elevator has a set of m buttons, one for each floor. These illuminate when pressed and cause the elevator to visit the corresponding floor. The illumination is canceled when the elevator visits the corresponding floor.*
- o *Each floor, except the first floor and top floor has two buttons, one to request and up-elevator and one to request a down-elevator. These buttons illuminate when pressed. The illumination is canceled when an elevator visits the floor and then moves in the desired direction.*
- o *When an elevator has no requests, it remains at its current floor with its doors closed.*
 - a. Draw a sequence diagram for ‘Serving Elevator Button’.

(10 marks)

2. Define a C++/Java program to implement the following UML diagram. Note that the types have not been indicated in the diagram but you should indicate them in the class definition. (20 marks)

