



MACHAKOS UNIVERSITY

University Examinations for 2022/2023

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

SIT 264: UNIFIED MODELLING LANGUAGE

DATE: 12/4/2023

TIME: 2:00 – 4:00 PM

INSTRUCTIONS

This Paper consists of FIVE questions

Answer question ONE and other TWO questions in this paper

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Briefly explain the difference between the following pairs of terms. (6 marks)
- Subclass / super class
 - Message / Method
 - Encapsulation / data hiding
- b) Using proper symbols outline the THREE UML relationships (6 marks)
- c) Draw a class diagram, including class attributes, to represent the information given in the paragraph below. (5 marks)
- “A dental surgery keeps information about its patients, who may be either private or Public health service provider. For each patient the surgery records the name, address, phone number, date of birth and either the health service number or the payment method”.
- d) A hospital admission system records the details of the admission, treatment and discharge of all patients. It also provides a number of official reports to satisfy the requirements of external authorities. Admission consists of the following tasks: Administration staff enters the patient’s personal details from a completed hospital admission form and sometimes helping them to complete the form. Next they allocate appropriate hospital accommodation if one or more nights stay is required. Following this they assign a doctor

to attend for an initial examination, and check (in the case that private medical care is required) that the patient has valid medical insurance. Doctors and nurses use the system to record medical care given to patient during their stay. (This medical care consists of treatments given and drugs administered). Only a doctor may prescribe drugs to a patient, and this information is also recorded in the system. Both doctors and nurses may administer drugs and doses are similarly recorded. Only doctors have the authority to discharge a patient, and this information is, again, recorded within the system.

From the above narrative

- i) Identify the use cases and actors of the hospital admissions system. (8 marks)
- ii) Develop a possible use case diagram for the above narrative (5 marks)

QUESTION TWO (20 MARKS).

- a) Visibility is used to specify which attributes and operations can be seen by the class objects. Discuss the THREE levels of Visibility (6 marks)
- b) State FOUR advantages of object oriented methodology (2 marks)
- c) Explain FOUR different views in UML (4 marks)
- d) A security light system has a switch and a motion sensor attached. It can be either *armed* or *unarmed*. If the switch is in the *off* position the light is off and the system is unarmed. When the switch is turned on, the light stays off but the system is armed. If the system is armed and the motionsensor detects movement, the light comes on. If no movement is detected for 5 seconds, the light goes off.

Draw a UML state-chart diagram to describe the states of the security light system.

(8 marks)

QUESTION THREE (20 MARKS).

- a) i) Draw a class diagram representing a book defined by the following statement: “A book is composed of a number of parts, which in turn are composed of a number of chapters. Chapters are composed of sections.” Focus only on classes and relationships. (5 marks)
- ii) Add multiplicity to the class diagram you produced in (a) above. (4 marks)
- iii) Draw an object diagram representing the first part of this book (i.e., Part I, Getting Started). Make sure that the object diagram you draw is consistent with the class diagram of (a (i)) above. . (5 marks)

- b) Suppose that you are asked to build a system that allows *Remote Pair Programming*. That is, the system should allow the driver and the observer to be in remote locations, but both can view a single desktop in real-time. The driver should be able to edit code and the observer should be able to “point” to objects on the driver’s desktop. In addition, there should be a video chat facility to allow the programmers to communicate. The system should allow the programmers to easily swap roles and record rationale in the form of video chats. In addition, the driver should be able to issue the system to backup old work. Draw a use case diagram to show all the functionality of the system. (6 marks)

QUESTION FOUR (20 MARKS)

- a) Consider the process of ordering a chapati over the phone. Draw an activity diagram representing each step of the process, from the moment you pick up the phone to the point where you start eating the chapati. Include activities that others need to perform. (8 marks)
- b) Objects can be related in other ways than by inheritance and aggregation. Any relationship between real world object can be modeled. Illustrate with examples the relationships that exist (6 marks)
- c) Explain different types of events within the UML (6 marks)

QUESTION FIVE (20 MARKS)

- a) Draw a state chart diagram to illustrate the behavior of a child’s bank account, where no Overdraft is allowed. The account is empty to start with. Money can then be deposited, to put the account in credit, and taken out as long as the account does not become overdrawn. The account can only be closed when the balance is Zero. (8 marks)
- b) Using question 5 (a) above, draw a collaboration diagram (4 marks)
- c) Explain different types of messages as used in sequence diagrams (8 marks)