



Machakos University

University Examinations 2022/2023

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

SCO 208: OBJECT ORIENTED ANALYSIS AND DESIGN

Date: DECEMBER

Time:

Instructions

This Paper consists of FIVE questions

Answer question ONE and any other TWO questions in this paper

QUESTION ONE (30 Marks).

- a) Briefly explain the difference between the following pairs of terms. [6 marks]
- i. Class / object
 - ii. Attribute / operation
 - iii. Message / Method
- b) Explain the following concepts as used with object oriented programming [6 marks]
- i. Inheritance
 - ii. Polymorphism
 - iii. Encapsulation

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 case scenarios 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. Explain the four levels of Visibility [4 marks]
- b) State FOUR advantages of object oriented methodology [4 marks]
- c) Explain different views in UML [4 marks]
- d) Draw a sequence diagram for a customer who wants to deposit money in his savings account through the ATM, the ATM should generate a receipt [8 marks]

QUESTION THREE (20 Marks).

- a) 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 motion sensor 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]

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.(8 marks)

c) Outline FOUR benefits of object oriented modelling [4 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. [6 marks]

b) Draw an activity diagram to show steps in ATM transaction in a bank [6 marks]

c) Explain FOUR different types of events within the UML [8 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. [6 marks]

b) Explain four different types of messages as used in sequence diagrams [8 marks]

c) Identify the **actors** and the **objects** in the following scenario to register a patient in a hospital management system [6 marks]

The administrator enters the patient’s name, address, date of birth and emergency contact details into the system. If the patient has only public health insurance, the administrator enters the patient’s medicare number, and the system verifies this with government health database. If the patient also has private health insurance, then the administrator enters also the patient’s private health insurance details, and the system verifies these details with the private health insurance system. When these details are verified as correct, the system saves the patient's details and confirms the