KENYATTA UNIVERSITY
EXAMINATION FOR THE DEGREE OF INFORMATION TECHNOLOGY

SIT 309: OBJECT ORIENTED DESIGNS

2ND SEMESTER 2023/2024 **TIME: 2 HOURS**

INSTRUCTIONS:

This paper consists of **TWO** sections (**A** and **B**). Answer SECTION A **(COMPULSORY)** and **ANY TWO QUESTIONS** from **SECTION B**.

Section A- Compulsory (30 marks)

QUESTION 1

a. You own a small baking company where you make and design custom cakes for different occasions. You now wish to take your business online so that you can cater for a larger customer base. You hire a web development company to build an online cake store for you. The developers suggest that object oriented approach would give you the best results.
   i. Explain five reasons behind the choice of object oriented approach. [5 Marks]
   ii. Outline three disadvantages of this approach [3 Marks]
   iii. Draw a suitable Use Case diagram for this scenario [5 Marks]

b. Use appropriate illustrations to show how 'create object' and 'destroy object' can be represented in UML sequence diagrams. [4 Marks]

c. Explain the conceptual difference between 'includes' and 'extends' relationships as used in use case diagrams. [4 Marks]

d. Visibility is used to specify which attributes and operations can be seen by the class objects. Discuss the Four levels of Visibility. [4 marks]

e. Consider a system that includes a Web server and two database servers. Both database servers are identical: the first acts as a main server, and the second acts as a redundant back-up in case the first one fails. Users use Web browsers to access data through the Web server. They also have the option of using a proprietary client that accesses the databases directly. Draw a UML deployment diagram representing the hardware/software mapping of this system. [5 Marks]

Section B –Answer any Two Questions (Each question 20 marks)

QUESTION 2

a. Describe the role of requirement management in object oriented systems development [4 Marks]

b. Explain 5 differences between design patterns and frameworks [5 Marks]

c. Outline the difference between OOD and OOA [3 Marks]

d. 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. [2 Marks]

ii. Add multiplicity to the class diagram you produced in a (i) above. [2 Marks]

iii. Extend the class diagram of a.(i) above to include the following attributes:

•a book includes a publisher, publication date, and an ISBN

•a part includes a title and a number

•a chapter includes a title, a number, and an abstract

•a section includes a title and a number [2 Marks]

e. 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 in (a) above. [2 Marks]

QUESTION 3

a. Distinguish between fork, branch and join nodes as used in activity diagrams [6 Marks]

b. Describe the four roles of UML Use Case diagrams in object oriented software development [4 Marks]

c. Distinguish between requirements Elicitation, Analysis and Specification as used in requirements engineering. [6 Marks]

d. Draw a class diagram, including class attributes, to represent the information given in the paragraph below. A dental surgery keeps information about its patients, who may be either private or health service. For each patient the surgery records the name, address, phone number, date of birth and either the health service number or the payment method. [4 Marks]

QUESTION 4

a. There are four types of sequence frames in Object Oriented Design. Name three and explain the role played by each of them in OOD. [6 Marks]

b. Rational Unified Process organizes work and iterations across four major phases. Name the phases and explain two key activities in each of them. [4 Marks]

c. Prepare an activity diagram for awarding marks to regular students. If the student has attended 80% classes, he is awarded minimum 5 marks. If the student has attended more than 80% classes, he is awarded minimum 10 marks. The students who have completed assignments are given 10 marks. Those who have completed 50% of assignments are given 5 marks and the rest are given 0 marks. [5 Marks]

d. Consider a traffic light system at a four-way crossroads (two roads intersecting at right angles). Assume the simplest algorithm for cycling through the lights (e.g., all traffic on one road is allowed to go through the crossroad, while the other traffic is stopped). Identify the states of this system and draw a state machine describing them. Note that each individual traffic light has three states (green, yellow, and red). [5 Marks]

QUESTION 5

a. Describe the four phases of Rumbaugh's Object Modelling Technique? [4 Marks]

b. Distinguish between composition and aggregation class relationships [2 Marks]

c. Explain three roles of UML component diagrams in Object Oriented System Development. [3 Marks]

d. Draw a state 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. [5 Marks]

e. ABC Company uses a computerized sales processing system. The system handles purchase, payments, credits and debit adjustments. Transactions are input to the system and processed on monthly basis. The transactions involve creation, updating or deleting of customers' files and other transaction details. An invoice is printed out and the serial number recorded in an invoice register. The system also displays the total purchases, payments, transaction data and current balances from monthly transactions. Develop an activity diagram that can be used by a designer of this system. [6 Marks]