Indian Institute of Technology Roorkee

Department of Computer Science and Engineering

End-Term Examination, B.Tech. II (CSE) Nov, 2023

Object Oriented Analysis and Design CSN-291

Maximum Marks: 50 **Time Allowed: 3 Hours**

Read the following instructions carefully:
1. Attempt ALL questions.
2. Attempt all parts of a question together. Attempt questions in the same order as given in the question paper. Follow this instruction strictly.
3. In addition to correctness of answer, the quality of the answer will also be considered during evaluation.

Question-1

(a) **Which** of the following UML diagram cannot capture the dynamic model of the system? **Justify** your answer with the help of example. [1+1=2 Marks]

(i) State chart diagram (ii) Sequence interaction diagram (iii) Class Diagram (iv) Activity diagram

(b) With reference to Class Diagrams in UML, **which** of the following is false for composition relation between classes? **Explain** with the help of an example. [1+1=2 Marks]

(i) It cannot be reflexive. (ii) It cannot be transitive. (iii) It is not symmetric. (d) It is not equivalent.'

(c) Show the following relation using class diagram **constructs**: [1+1= 2 Marks]

One order can have many items.

(d) [**Fill** in the blanks and **explain**] Two types of Interaction diagrams in UML are: …….. and ……. Briefly explain both. [1+1= 2 Marks]

(e) In the object model, compare **heavyweight** concurrency and **lightweight** concurrency. [1+1=2 Marks]

Question-2

(a) [**Fill** in the blank and give **reason**] During preparation of CRC cards, Index cards are prepared. Each index card have following three components:……., ……., ……. [1+1+1=3 Marks]

(b) Specify **problem definition** and **solution** for the 'Model View Controller (MVC)' design pattern. [1+1+1=3 Marks]

(c) Show the structure of a typical sequence diagram and **mark and briefly explain** its various elements. [1+1+1=3 Marks]

(d) Consider the following statement with special emphasis on the highlighted terms: An object has **state**, exhibits some well-defined **behaviour**, and has a unique **identity**. [1+1+1=3 Marks]

(e) As you know, activity diagram can be used to represent parallel activities and synchronization aspects among activities. Take any suitable example and show how it can be used to represent **parallel activities and synchronization** among activities. Briefly **explain** each. [1+1+1=3 Marks]

Question-3

(a) Abstraction is one of the major elements of the Object Oriented Model. **Briefly explain** data abstraction and behavior (feature) abstraction. Take an example to specify, **how** behavior abstraction is related to inheritance. [1+1+1= 3 Marks]

Problem Specification for (b) and (c): Given the problem specification as below:

Train Management System is a committed and profoundly configurable framework for railways, which can be effectively accessed by clients. It encourages the clients to book trips without visiting station booking counters. Any client can get to this framework from any area whenever. In such a framework, a traveler ought to have the option to see the accessibility of train details, according to their prerequisite. They can book trains on the web and can likewise cancel the reservation. The administrator deals with the traveler booking framework and updates the reservation status.

(b) Based on above mentioned problem specification, draw the sequence diagram for ticket reservation use case. [3 Marks]

(c) Based on above mentioned problem specification, draw the sequence diagram for ticket cancellation use case. [3 Marks]

(d) **Which** of the following is False with reference to Interaction Diagrams? **Justify** your answer along with **explanation** of the true statements out of the following. [1/2+1/2+1+1=3 Marks]

i) It represents how behavior of object changes with time.

ii) It captures how different objects interact each other.

iii) It typically realizes behavior of a single use case.

(e) A supermarket needs to develop software to encourage regular customers. Following description of a software system for the supermarket is given: [1+1+1=3 Marks]

- Customer needs to supply his following information for registration:
  Name, Residence address, telephone number, and the driving license number.
- Each customer who registers is assigned a unique customer number (CN) by the computer.
- The sales to each customer is registered against CN number by Sales Clerk.
- At the end of each year, the manager awards surprise gifts to ten customers who make highest purchase.

Show the use case model diagram for the above problem.

Question-4

(a) With reference to modular design, **what** is the fundamental of layering principle? **Explain** with the help of diagram. [1+1=2 Marks]

(b) With reference to state chart diagrams, **which** of the following statement is False? **Also**, explain the true statements. [0.5*4= 2 Marks]

(i) State is represented by a rectangle with rounded corner.
(ii) These are normally used to model behavior of a system with several objects.
(iii) These show the behavior of an object changes with time.
(iv) These are based on finite state machine.

(c) According to object oriented concepts, softwares are inherently complex. There are various human cognitive limitations in dealing with this complexity. **Specify and discuss** the four solutions for dealing with these human cognitive limitations. [0.5*4= 2 Marks]

(d) **Specify** any **two** constructs of structured programming with the help of corresponding **flow-charts**. [0.5*4= 2 Marks]

(e) **Discuss** following parameters which are used for knowing quality of the object design: [0.5*4= 2 Marks]

i. Cohesion
ii. Coupling
iii. Sufficiency
iv. Primitiveness