

Part - I (Maximum time for this part is first 75 minutes)

**Birla Institute of Technology & Science, Pilani (Rajasthan)
Pilani Campus**

First Semester 2023-2024

ID.No.: _____

Comprehensive Examination (Closed Book) [Part-I 15% + Part-II 30%]

Name: _____

CS G514/SS G514

Object Oriented Analysis and Design

Dec 07, 2023 AN (02:00 PM – 05:00 PM)

Note: Students to write answers in the supplied answer-booklet for this part. No recheck acceptance for the answers attempted with pencil. Students can attempt Part-II after submission of Part-I answer-booklet or first 75 minutes of the examination whichever is earlier.

Q1. Answer the following briefly and concisely. For each part word limit is 100 words.

- 1.1** What is Controller with respect to GRASP?
- 1.2** What is singleton pattern? When is it used?
- 1.3** What is an association class? Give one example.
- 1.4** What is UML Method and how it may be illustrated using UML notations?
- 1.5** List (in order) the activities involved in access layer design process for business classes?

Marks Q1 [1 x 5 = 5]

Q2. The class diagram is expected to model a customer-order from a retail catalog. Associated with an order is 1). the customer doing the purchase and 2). the customer making the payment for the corresponding purchase. A payment can be done in one of three ways: Cash, Check, or Credit. An order contains OrderDetails, each with its associated item. Draw the class diagram using UML notations.

Marks Q2 [3]

Q3. It is required to draw a sequence diagram for making a hotel reservation. The object initiating the sequence of messages is a Reservation window. The Reservation window sends a makeReservation() message to a HotelChain. The HotelChain then sends a makeReservation() message to a Hotel. If theHotel has available rooms, then it makes a Reservation and a Confirmation. Draw the sequence diagram using UML notations.

Marks Q3 [3]

Q4. A UML diagram is required to model the login part of an online banking system. Logging in consists of entering a valid social security number and personal id number, then submitting the information for validation. Logging in can be factored into four non-overlapping states: Getting SSN, Getting PIN, Validating, and Rejecting. From each state comes a complete set of transitions that determine the subsequent state. There are two self-transitions, one on Getting SSN and another on Getting PIN. Draw an appropriate diagram using UML notations.

Marks Q4 [3]

Q5. Write two contrasting differences between the following in the specified terms only.

- 5.1** Function call and Message Passing (in terms of who is responsible for choosing & who is designated receiver).
- 5.2** Abstraction and Encapsulation (in terms of their definition and what they group or separate)

Marks Q5 [(0.25x2) x 2 = 1]

Part - II

**Birla Institute of Technology & Science, Pilani (Rajasthan)
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First Semester 2023-2024

ID.No.: _____

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CS G514/SS G514

Object Oriented Analysis and Design

Marks Obtained ↑

Examiner's Signature ↑

Dec 07, 2023 AN (02:00 PM – 05:00 PM)

Note: To answer Q1, write in the grid given below the capital letters (A, B, C, D) corresponding to first and second choices in row I & II respectively. Marks will be awarded only if both the choices are correct. To answer Q2, write in the row labeled 'A/B/C/D' the capital letter corresponding to the choice. No recheck-acceptance for overwritten (or lower-case for Part- II or answers written with pencil) answers.

Totaling mistake ONLY ↓	Please recheck Q# ↓	Examiner's Comments ↓
Actual total is _____.		

Q1.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
I																								
II																								

Q2.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A/B/ C/D																								

Q1. For each part select exactly two correct choices among the four given. Each part carries 0.75 marks.

- 1.01** Which of the following statements are TRUE about Use Cases?
 A. Use case diagrams are the primary tool to document requirements
 B. Use cases provide the basis of communication between sponsors and developers in planning phase
 C. Use cases description provides a good source to identify domain concepts
 D. A fully-dressed use case should include both "whats" and "hows" so that they are ready for "realization"
- 1.02** During elaboration, the risks can be classified as:
 A. Security risks e.g. virus, intrusion
 B. Requirements risks
 C. Financial risks
 D. Technology risks
- 1.03** Different perspectives during OOAD.
 A. Conceptual
 B. Domain
 C. Design
 D. Specification
- 1.04** Package diagrams are designed for:
 A. depicting the overall structure of a system
 B. assisting testing
 C. assisting deployment
 D. reducing dependency
- 1.05** True for use case:

- A. a use case captures some user-visible and non-visible functions
 B. a use case may have many scenarios
 C. a use case can be traced to a discrete goal
 D. UML use case diagrams are designed to replace textual description since a picture is better than a thousand words
- 1.06** True about Actors:
 A. an actor is a role a user plays with respect to the system
 B. generalization is not applicable to actors
 C. an actor does not need to be human.
 D. An external system cannot be modelled as an actor
- 1.07** Which are valid relationships in Use Case Diagrams?
 A. use
 B. generalization
 C. sub-typing
 D. extract
- 1.08** True statements:
 A. Derived associations and attributes can be found in class diagrams and interaction diagrams.
 B. Derived associations and attributes can be found in class diagrams only.
 C. Within a specification perspective, derived associations and attributes indicate an implementation option e.g. optimization and performance considerations.
 D. Within a specification perspective, derived associations and attributes indicate a constraint between values.
- 1.09** False statements about interaction diagrams:

- A. Interaction diagrams is the superset of Sequence diagrams and Collaboration diagrams
 B. An interaction diagram captures the behaviour of a single or more use cases
 C. Within Sequence Diagram, each vertical line is called the object's lifeline; each message is represented by an arrow between the lifelines.
 D. Condition is represented by { xxx }
- 1.10** False about sequence diagrams:
 A. Sequence Diagrams can also capture concurrent activities.
 B. Activations should not be used for concurrent activities
 C. Asynchronous message is represented by "half-arrow";
 D. Asynchronous message blocks the caller until it is completed.
- 1.11** True about collaboration diagrams:
 A. These are used to depict objects interaction.
 B. The numbering scheme starts from 0
 C. UML object naming syntax - objectName : ClassName
 D. Collaboration Diagrams are preferred because the layout indicates how objects are statically connected
- 1.12** True about Package Diagrams:
 A. Dependency is indicated by a solid line with arrow head at one end
 B. Package is an object-oriented approach in managing system structure
 C. A package may contain class, list of classes, another package

- D. Whenever a class diagram that encompasses the whole system is no longer legible on a single letter-size sheet of paper.

1.13 False about State Diagrams:

- A. More advanced State Diagrams are drawn for multiple objects
- B. UML transition syntax has 3 parts: Event [Guard] / Action, all of which are optional
- C. Actions are associated with transitions and are considered to be processes that occur quickly and are not interruptible.
- D. A guard is a logical condition that will return either "true" or "false". A guard transition occurs only if the guard returns "false"

1.14 False about Activity Diagrams:

- A. From conceptual perspective, an activity is some task that needs to be done, whether automated or manual
- B. From specification perspective, an activity is a method of a class
- C. It is illegal to have an activity followed by another activity
- D. Activity diagram could depict parallel activities and it imposes which one should be executed first

1.15 False about Deployment Diagrams:

- A. A component represents some kind of software source code
- B. A connection is the communication path between two hardware components
- C. The dependencies among components is the same as package dependencies
- D. It is a good practice that each component should have one and only one interface.

1.16 False about the goals of Inception:

- A. Is it feasible?
- B. Are we going to buy or build?
- C. Provide accurate estimates of cost
- D. Produce a development schedule

1.17 Which documents are NOT part of the deliverables at the end of Inception?

- A. Build prototypes if appropriate
- B. High level domain model
- C. High level business use cases
- D. Iteration plan

1.18 False about the Procedural Approach:

- A. Procedures and data are clearly separated.
- B. Procedures are often hard to reuse.
- C. No transformation of concepts between analysis & implementation.
- D. This programming paradigm is essentially an implementation of machine / assembly language.

1.19 False about the Object-Oriented Approach:

- A. Modelling of the domain as objects so that the implementation naturally reflects the problem at hand.
- B. Visual models are expressive and relatively easy to comprehend.
- C. Design models are only a small step from implementation.
- D. The use of UML guarantees that the targeted system conforms to object-oriented principles.

1.20 Which are wrong guidelines for Domain Modeling?

- A. Add the associations.
- B. Add the attributes.
- C. Add the operations
- D. Draw them in Activity diagrams.

1.21 True statements if the classes A, B & C reside on different packages and the dependency is $A \rightarrow B \rightarrow C$.

- A. Change of a private method of B may affect A.
- B. Change of a public method of B may affect A.
- C. Change of a public method of C may affect A.
- D. Change of a public method of C may affect B.

1.22 Which two stages precedes the other two?

- A. Inception
- B. Elaboration
- C. Construction
- D. Transition

1.23 Which two numbers depict number of development disciplines and number of support disciplines respectively in unified process for software development?

- A. 6
- B. 3
- C. 7
- D. 2

1.24 Two aspects of time with respect to system conception

- A. Idle time
- B. Feasible time
- C. Active time
- D. Required time

Q2. For each part a pair of statements is given, answer as A if statement S1 alone is true, B if statement S2 alone is true, answer as C if both the statements are true, else answer as D. Each part carries 0.5 marks.

2.01 S1: User manuals are normally organized based on use cases. **S2:** Proto typing capture solutions, not just abstract principles or strategies.

2.02 S1: A report object is an essential element in a domain model. **S2:** From a conceptual perspective associations represent conceptual relationships between classes.

2.03 S1: Messages essentially are non-specific function calls. **S2:** Test model presents how the source code should be carried out and written.

2.04 S1: Dynamic inheritance allows objects to change and devolve over time. **S2:** Macro development process identifies class and object relationship.

2.05 S1: Within UML, stereotypes are used for meta-model extensions. **S2:** The unified approach steps can overlap each other.

2.06 S1: Private members are accessible only from within a class. **S2:** The intersection among object roles to achieve a given goal is called linking.

2.07 S1: One object can refer other object is known as cardinality. **S2:** Call returns essentially are non-specific function calls.

2.08 S1: Patterns are commonly applied during coding. **S2:** Pattern captures solutions, not just abstract principles or strategies.

2.09 S1: The objects of the "real" world are mapped in to the Domain Object Model. **S2:** Interaction diagrams are good at precise definition of the behaviour.

2.10 S1: Classes are used to distinguish one type of object from another. **S2:** If the same item can be associated with multiple containers of the same type, then use a regular association.

2.11 S1: The intersection among object roles to achieve a given goal is called collaboration. **S2:** Collaboration diagram represents a set of objects related in a particular context and interaction.

2.12 S1: A method implements the behavior of an object. **S2:** Responsibilities are related to the obligations of an object in terms of its behavior.

2.13 S1: In OO approach system is organized around objects. **S2:** Use "is a" to test sub-typing.

2.14 S1: An interface is a set of classes used on a collaboration. **S2:** Setters and getters operations should not be included in the Design Model.

2.15 S1: Classification refers to the relationship between an object and its type. **S2:** Development case is a document defining the case tools adopted by a project.

2.16 S1: The process of looking for patterns to document is called Pattern Mining. **S2:** In OO approach system is organized around objects.

2.17 S1: Visitor pattern would resolve incompatible interfaces. **S2:** Interaction diagrams are good at showing collaborations among objects.

2.18 S1: The process of determining at run time which function to involve is termed as dynamic binding. **S2:** The process of determining at run time which functions to involve is termed as soft binding.

2.19 S1: In pre-object protection methods can access only by the receiver. **S2:** Different objects can respond to the same message in different ways is known as inheritance.

2.20 S1: It is a common practice to record system features as rules. **S2:** Use-case realization is part of requirements gathering activity.

2.21 S1: It is illegal to include an attribute to an association class. **S2:** Class of classes is also known as data-class.

2.22 S1: Setters and getters operations should not be included in the Design Model. **S2:** An important issue in association is diversity.

2.23 S1: Fault-tolerance and scalability can be defined in System Use Case. **S2:** Class stereotypes are interface objects, control objects and entity objects.

2.24 S1: When partitioning a class into subclass, the subclass has additional attributes of interest. **S2:** Functional model is presented by the state diagram and event flow diagram.