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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2025 - 2026)

Subject: Software Design with UML

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

20

1. Attempt all parts:-

(1.1) Grady Booch, James Rumbaugh, and Ivar Jacobson are known for: (CO1,K1)

1

- (a) Structured programming
- (b) Waterfall Model
- (c) Unified Modeling Language (UML)
- (d) Assembly language

(1.2)quality characteristic means "resistance to failure".(CO1,K1)

1

- (a) Usability
- (b) Reliability
- (c) Efficiency
- (d) Portability

(1.3) Identify language element controls variable visibility.(CO2,K1)

1

- (a) Data type
- (b) Access modifier
- (c) Loops
- (d) Conditionals

(1.4) The language element that determines visibility and lifetime of variables is:(CO2,K1)

1

- (a) Data type
- (b) Scope
- (c) Binding
- (d) Lexical structure

- (1.5) A method in UML differs from an operation in that a method:(CO3,K1) 1
- (a) Provides implementation of an operation
 - (b) Defines interface only
 - (c) Represents only attributes
 - (d) Exists only in sequence diagrams
- (1.6) Numbering of messages in a collaboration diagram indicates: (CO3, K1) 1
- (a) Execution priority and sequence
 - (b) Data types
 - (c) Memory usage
 - (d) Actor hierarchy
- (1.7) Package dependency arrow direction points from dependent package to independent package meaning:(CO4,K1) 1
- (a) Dependent needs independent
 - (b) Independent needs dependent
 - (c) Both need each other
 - (d) No direction
- (1.8) Interface between two packages in black box view uses this notation.(CO4,K2) 1
- (a) Solid line with arrow
 - (b) Dashed line with lollipop and socket
 - (c) Dotted line with diamond
 - (d) Double line with circle
- (1.9) A fork node in an activity diagram represents splitting of control flow into parallel paths. (CO5,K2) 1
- (a) Merging multiple flows
 - (b) Ending of process
 - (c) Object creation
 - (d) Parallel execution of activities
- (1.10) Identify element triggers state transition. (CO5,K1) 1
- (a) Package
 - (b) Class
 - (c) Object
 - (d) Event

2. Attempt all parts:-

- (2.1) Define inheritance in object-oriented programming.(CO1, K2) 2
- (2.2) State the meaning of semantics in programming language context. (CO2,K1) 2
- (2.3) Give the importance of operations in a class diagram.(CO3,K2) 2
- (2.4) Define interface in UML package diagram context.(CO4,K1) 2
- (2.5) Identify the function of transitions in state diagrams. (CO5,K2) 2

SECTION-B

30

Answer any one of the following:-

(3.1)	Contrast the Waterfall Model and the Spiral Model in terms of phases, benefits, and drawbacks. (CO1, K4)	6
(3.2)	Analyze the main features of high-quality software and describe their impact on system reliability, maintainability, and usability. (CO1, K4)	6
Answer any one of the following:-		
(3.3)	Evaluate modeling language components and their importance in system representation. (CO2, K5)	6
(3.4)	Describe the different types of design patterns and explain their usage in software development with examples.(CO2,K2)	6
Answer any one of the following:-		
(3.5)	Analyze UML interaction diagrams and compare Sequence and Collaboration diagrams based on structure and usage. (CO3,K4)	6
(3.6)	Evaluate system requirements and analyze the role of actors and case goals in Use Case Diagram development. (CO3, K5)	6
Answer any one of the following:-		
(3.7)	Describe the Package Diagram Model and illustrate white box and black box representations. (CO4, K2)	6
(3.8)	Evaluate the Class Diagram Model and analyze the role of attributes, operations, and relationships in system structure. (CO4, K5)	6
Answer any one of the following:-		
(3.9)	Illustrate the UML Deployment Model and examine the role of processors, components, connections, and tasks in system deployment. (CO5, K5)	6
(3.10)	Describe how processors and software components interact in a UML Deployment Model. (CO5, K3)	6
SECTION-C		50
4. Answer any <u>one</u> of the following:-		
(4.1)	Analyze a university system and evaluate how real-world entities are mapped into classes with attributes and behaviors. (CO1,K4)	10
(4.2)	Evaluate the significance of signals, events, and threads in system deployment architecture.(CO1,K5)	10
5. Answer any <u>one</u> of the following:-		
(5.1)	Evaluate the effectiveness of standards in ensuring maintainability and quality in Object-Oriented Software Development.(CO2,K4)	10
(5.2)	Analyze software development models and compare their characteristics, advantages, limitations, and suitability for different projects. (CO2,K4)	10
6. Answer any <u>one</u> of the following:-		
(6.1)	Construct a use case diagram for a hospital management system and describe actors, use cases, and relationships in detail. (CO3, K3)	10
(6.2)	Evaluate use case relationships in UML and explain the role of include, extend, and generalization in improving system modeling and design understanding. (CO3, K5)	10
7. Answer any <u>one</u> of the following:-		
(7.1)	Illustrate UML generalization by designing a Vehicle parent class with Car and	10

Bike subclasses having unique attributes. (CO4, K3)

- (7.2) Evaluate package dependencies and relationships and describe their importance in modular system architecture. (CO4, K5) 10

8. Answer any one of the following:-

- (8.1) Illustrate a state transition model for an ATM system showing normal flow and exception handling states. (CO5, K3) 10

- (8.2) Design a state machine model for an ATM system and describe normal operations, error handling, and recovery states in detail. (CO5, K3) 10

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