CS / M.Tech(SE) / SEM-2 / PGSE-202 / 09

OBJECT ORIENTED SOFTWARE ENGG. & UML (SEMESTER - 2)

1. ....
Signature of Invigilator

2. ....
Signature of the Officer-in-Charge

Reg. No.

Roll No. of the Candidate

CS / M.Tech(SE) / SEM-2 / PGSE-202 / 09

ENGINEERING & MANAGEMENT EXAMINATIONS, JULY – 2009

OBJECT ORIENTED SOFTWARE ENGG. & UML (SEMESTER - 2)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. You have to answer the questions in the space provided marked 'Answer Sheet'. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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Marks Obtained

Question Number											***Total Marks***	***Examiner's Signature***
Marks Obtained												

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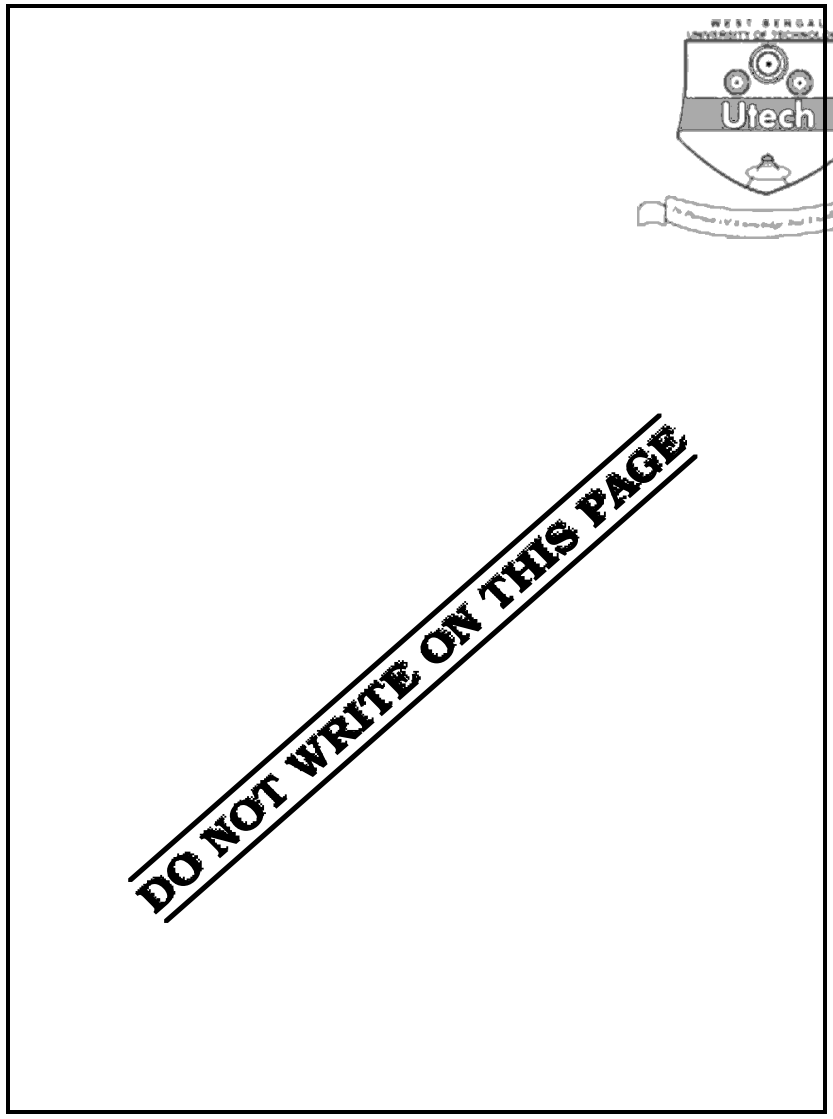
Head-Examiner / Co-Ordinator / Scrutineer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The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer Question no. 1 and any *four* from the rest. 5 × 14 = 70

1. a) What diagram type(s) can be used to describe the following (any *eight*) : 8 × 1

- Behavior of an object
- Interaction between different objects
- Life-cycle dependencies of objects
- Generalization of domain-specific concepts (documents, persons, ...)
- Specialization of user roles and their interactions with a system
- One specific case of behaviour of objects
- Many cases of dynamic interaction between objects in one diagram
- Location of software components on the hardware
- Organization of a large amount of classes
- 1-to-many relationships between classes
- Behaviour over time

b) State whether following statements are True or False : 2 × 1

i) An aggregation implicitly defines a 1 : *n* relationship.

ii) UML is a language for constructing.

c) Mention the following mechanisms in the UML with examples : 4 × 1

i) Specifications

ii) Adornments

iii) Common Divisions

iv) Extensibility mechanisms.

2. a) Why is it necessary to have a variety of diagrams in a model of a systems ? 2

b) Classify the following UML diagram types as static or dynamic diagram types : 7 × 1

Class diagram

State diagram

Sequence diagram

Interaction diagram

Use case diagram

Package diagram

Deployment diagram.

Justify by a sentence for each diagram why it is a static or dynamic diagram type.

c) What is the conceptual difference between the "include" and the "extend" relationship ? 3

d) What is an Active Class ? 2

3 a) What is the difference between aggregation, association and composition ? Give appropriate example of each one. 6

b) Define the following object-oriented aspects : 3 × 2

i) Abstraction

ii) Inheritance

iii) Polymorphisms.

c) What is Abstract Class ? 2

4. a) There are two different types of interaction diagrams : sequence and collaboration diagrams. Compare the two types of diagrams. What are the key differences between those diagram types considering their characteristics and their application ? 3 + 3

b) Create a use case diagram for ATM system. 6

Specify the assumptions made by you.

c) What is realization ? 2

5. In answering question below, state clearly any assumptions you made :

A university car park provides free parking for its staffs and a limited number of visitors. For employees of the university, it uses the information on the staff card to control access to the car park. The staff card records the employee's name, department's name, staff identity number and expiry date.

A barrier, a card reader and a sensor are placed at the entrance of the car park. The driver inserts the staff card into the card reader. The car park system checks the card number. If the number is valid, the system sends a signal to raise the barrier to allow the vehicle to enter the car park. The sensor sends a signal back to the system to lower the barrier when the vehicle has entered. There is an identical system at the exit.

Visitors are allowed access to the car park by using a visitor card, which can be collected in person from the car park administration office beforehand. The visitor card records a visitor identity number and the current date. All visitors' cards must be returned to the administration office when the visitor leaves the site so that they can be deleted from the list of valid cards. The list of valid cards is updated by the card park administrator.

When there are no spaces in the car park, a sign at the entrance will display "Full", and no vehicle is allowed to enter into the car park. The sign is only switched off when a vehicle leaves and a space becomes available.

a) Draw a UML class diagram for the university car park system. The class diagram should represent all the classes, their attributes and operations, relationships between the classes (*i.e.* associations, aggregation and inheritance), multiplicity specifications and other model elements that you find appropriate.

b) Draw a sequence diagram for the process of entering the university car park. Use the scenario described below to obtain the process flows for your sequence diagram.

- The driver inserts his/her card
- The card reader reads the card number
- The system checks if the card number is in the list of valid card numbers
- The system checks if there is a space
- If there is a space and the card is valid the system sends a message to the barrier to lift up
- The driver is told to enter the car park
- The sensor sends "car passed" message to the system after the car has passed
- The system sends a message to the barrier to lower
- The system decreases the number of available spaces by 1 2 × 7

6. a) What is difference between action and activity ? What is the significance of swimlanes in activity diagrams ? 2 + 2

   b) Draw the state diagram to model different states in life cycle of a thread in Java. 6

   c) What is the need of deployment diagram ? 2

   d) What is the significance of lifeline in sequence diagram ? 2

7. Write short notes on any *two* of the following : 2 × 7

   a) Packages and components in UML

   b) Object flow in sequence diagram

   c) Architectural pattern.

8. Given below is a brief textual description of a system. Read it carefully : 14

   Library System :

   The Library System is used by the informatics students and faculty. The library contains Books and Journals. Books can be issued to both the Students and Faculty. Journals can be issued to the Faculty. Books and Journals can only be issued by the Librarian. The deputy Librarian is in-charge of receiving the returned books and journals. The accountant is responsible for receiving the fine for overdue books. Fine is charged only to students and not to the faculty.

   i) Identify the Classes/Objects

   ii) Draw the Conceptual Model (the object relationship diagram)

   iii) Assign Multiplicity/Cardinality

   iv) Identify at least two attributes and functions for each class/object

   v) Can you identify any inheritance, association, aggregation and dependencies ?

   vi) Draw a complete conceptual model using the UML.

9. Draw a static and dynamic model of a pay-roll system of an organization. Mention assumptions made by you about the system. 7 + 7

END