Module: Object Oriented System Design

1) Define Inheritance. Explain the different types of inheritance with an example of each.
2) Differentiate between class and object by giving an example of each.
3) Give any three types of association with an example for each.
4) What is Class Diagram? Explain in detail.
5) What is Use Case Diagram? Explain its different Notations
6) What is modeling, explain the usefulness of modeling.
7) Draw the UML notations for the following: Actor, Use Case, Class, Association, Generalization, and Aggregation.
8) Describe the terms:
   a) Dynamic Binding b) Encapsulation c) Design Guideline for OOP
9) Differentiate between Aggregation and Generalization within the context of class diagram.
10) Write the name of different category of UML diagram.
11) Draw an activity diagram for the following scenario with activities, swimlanes, fork, branching and join wherever necessary.

    Scenario: "Withdraw money from a bank account through ATM"
12) Explain the *characteristics of class* with an example
13) Differentiate between *unary* and *binary* associations with an example for each.
14) Draw a *class diagram* for the following scenario *order processing* with appropriate *classes, relationships and multiplicities*.

    Order processing Scenario: *Customer can order from a retail catalogue. Based on the order placed, customer makes the purchase and the Payment. Customer can make Payment in one of the three modes: Cash, Check, or Credit. The order contains Order Details, each with its associated Item.*
15) Design a class model for the scenario: ***"A multimedia player has a unique code, colour, audio and video support. A multimedia player can play audio songs and it can also play video."***
16) Explain one-to-one, one-to-many and m*any-to-many association* with an example.
17) Explain Noun Identification Techniques used for identification of classes.

    Read the following scenario.

Books and journals: *The library contains books and journals. It may have several copies of a given book. Some of the books are for short term loans only. All other books may be borrowed by any library member for three weeks. Members of the library can normally borrow up to six items at a time, but members of staff may borrow up to 12 items at one time. Only members of staff may borrow journals.*

Borrowing: *The system must keep track of when books and journals are borrowed and returned, enforcing the rules described above.*

Apply *noun identification technique* and identify minimum four *candidate classes*. Answer should contain the results of *noun identification technique* and reasons for ignoring the nouns while identifying the *candidate classes*.

18) Read the following scenario: "*Cheque leaf and debit cards are two money transaction modes. Both cheque leaf and debit card has common features such as bank name, customer name. However, cheque leaf and debit cards have their own unique features. Money can be can be withdrawn using ATM cards using debit cards. In order to withdraw money a cheque leaf has to be deposited in bank."*

Identify minimum three *classes* for a possible implementation of the concept *inheritance* and explain with the help of a neat diagram.

19) List and explain any four types of *multiplicity* specifications. Explain the meaning of the following:
   a) 0..1
   b) 0..* or *
   c) 1
   d) 1..2
   e) 1..*

20) Explain *Object* and *Object state* with suitable examples.

21) Illustrate a *class model* for the following information and list two possible *objects*for the same *class*showing different *states*.*"A Student has student id and student name. Student can read a book and watch a movie."*

22) *Read the scenario:* "There are different types of *vehicles* available. Some vehicles run on land (*landvehicles*). Some run on water (*watervehicles*). However, all the *vehicles* have most of the common features. The *vehicle* which belongs to a particular type has some

additional features."Identify the *classes* for a possible implementation of the concept *inheritance* andexplain with the help of a neat diagram.

23) Describe *sequence diagrams* in brief. Draw a *sequence diagram* for the following hotel reservation scenario: *"A customer make request for reservation of a room through reservation window. The reservation window sends the reservation information to Hotel Chain. Next, the information will be further forwarded from Hotel Chain to Hotel. If the Hotel has available rooms, then it makes a reservation and a confirmation."*

24) Explain the characteristics of *class model*. Illustrate the class model for the scenario as given below:

"Each Animal in the universe has a name and voice. Animals are identified by their names and they used to make sound in their voice, for example: dog barking as bow...bow)"

25) Differentiate between *Aggregation* and *Generalization*within the context of *class diagram* using example for each.

26) Describe *Use Case Diagram*and show the notation and use of *Actor*, *UseCase*, and *extends*used in use case diagram.

27) Explain *Object diagram* in detail. Draw an *object diagram* for the following scenario. *"A department can contain sub departments such as Statistics department, Mathematics department. Mathematics department in turn can have Applied mathematics department and Algebra department".*

28) Explain any four design guidelines for *object oriented modelling.*

29) Draw a *class diagram* for the following scenario *order processing* with appropriate *classes, relationships and multiplicities*. ***Order processing Scenario***: *"Customer can order from a retail catalogue. Based on the order placed, customer makes the purchase and the Payment. Customer can make Payment in one of the three modes: Cash, Check, or Credit. The order contains Order Details, each with its associated Item"*

30) Explain the concept of *binary* and *unary association.* Give one example each for *binary* and *unary association.*

31) List and explain any two features of UML diagrams. Identify the different category of UML diagrams; give the name of one diagram for each category.

32) Discuses any three types of association and different types of multiplicities a designer can use in designing UML diagrams using suitable examples for each.

33) Use case specification serves as a 'bridge' between stakeholders of a system and the development team. Discuss this statement with the help of an example of your choice.

34) "Good modules exhibit low coupling but high cohesion". Comment briefly why software developers are striving to maintain this principle.

35) Draw a *UML Class diagram* for the scenario given below. Identify the *candidate classes* and their *relationships* with respective *role names* and *multiplicities*.

36) ***Scenario***

37) A product is to be installed to control elevators in a building with *m* floors. The problem concerns the logic required to move elevators between floors according to the constraints. Each elevator has a set of *m* buttons, one for each floor. These illuminate when pressed and cause the elevator to visit the corresponding floor. The illumination is cancelled when the elevator visits the corresponding floor. Each floor, except the first floor and top floor has two buttons, one to request a up-elevator and one to request a down-elevator. These buttons illuminate when pressed. The illumination is cancelled when an elevator visits the floor and then moves in the desired direction. When an elevator has no requests, it remains at its current floor with its doors closed.

Based on the following Java code snippet, identify the *creational pattern* used and describe it.

```
class Car

{

String name="Toyota";  int model_year=2009;

private static Car instance =new Car();
```

```
private Car()

{ }

public static Car getInstance() {  return instance; }

public String getName() {  return name; }

public int getmodel-year() { return model-year; }

}

public class Boss { public static void main(String args[]){

String a; int b;

a=Car.getInstance().getName();

b=Car.getInstance().getmodel-year();

System.out.println(" My car is "+ a);

System.out.println(" My modelno is "+ b);

}}
```

38) "If you use state diagrams, do not try to draw them for every object in the system". Discuss this statement by explaining why it is true in most practical UML diagramming.

39) Explain *Object* and *Object state* with suitable examples.

40) Draw a Sequence Diagram for the following hotel reservation scenario. "A customer make request for reservation of a room through reservation window. The reservation window sends the reservation information to Hotel Chain. Next, the information will be

further forwarded from Hotel Chain to Hotel. If the Hotel has available rooms, then it makes a reservation and a confirmation. “

41) Draw an activity diagram for course registration system.

42) Draw a use case diagram for Amizone system and facebook system.

43) Draw a complete state diagram for a telephone object. Your state diagram should incorporate all the possible active states that the object meets.

44) “If you use state diagrams, do not try to draw them for every object in the system”. Discuss this statement by explaining why it is true in most practical UML diagramming.

45) Discuss different patterns you studied and explain structural and behavioural pattern in detail.

46) Write short notes on the following: Collaboration diagram, state chart diagram, Object diagram.

47) What do you understand by the term “Realizing use cases in sequence diagram”, explain using suitable example.

48) Explore your understanding for logical architecture and UML package diagram. What are benefits of layered architecture?

49) What is model view separation principles. Explain Observer Pattern.

50) What is design pattern and explain the essential terms for design pattern.

51) Explain the different types of design pattern using their merits and demerits.

52) What are various design issues. Explain your understanding for Unified Approach to Design.

53) Draw a note on how to apply unified process in design.

54) What do you meant by analysis model and partitioning for the design.

55) Explain your understanding for object diagram using suitable example.

56) Explain different view of a system using a suitable diagram, write your answer focusing on the diagram.

57) What is meant by GRASP.

58) Write short notes on: Pattern, Controller, Creator, High Cohesion, Indirection and Low Coupling.

59) What is meant by GOF design pattern? Explain each GOF design pattern using suitable example.

60) Write short note on 4 + 1 model.