Part A Objectives

Question 1. a) MCQs

[0.25*20 = 5M]

1. Which of the following steps is/are applied to develop a decision table?
   a. List all actions that can be associated with a specific procedure
   b. List all conditions during execution of the procedure.
   c. Define rules by indicating what action(s) occurs for a set of conditions.
   d. All of the mentioned

2. Which task is performed during use-case realization refinement?
   a. identify participating classes
   b. allocate responsibilities among classes
   c. model messages between classes
   d. model associated class relationships

3. In the state of a state machine, a behavior can be defined _____.
   a. before reaching a state
   b. upon reaching and leaving a state
   c. inside a state
   d. b & c
   e. a & c

4. In Agile projects, we "learn as we go" because
   a. It creates a better relationship between the developers and customer representatives
   b. many projects are evolutionary, and a better solution emerges this way
   c. It is time consuming to analyze everything at the beginning of a project
   d. it prevents late delivery of a project

5. When identifying design elements, a simple analysis class will map to a(n)_____.
   a. active class
   b. interface
   c. design class
   d. subsystem

6. Which one of these is not one of the phase of Unified Process Model for software development?
   a. Inception phase
   b. Elaboration phase
   c. Construction phase
   d. Validation phase

7. Evolution is one of software processes, specification concern with.
   a. production of the software system
   b. changing the software in response to changing demands
   c. checking that the software is what the customer wants
   d. what the system should do and its development constraints

8. The student class in an enrollment system would be an example of a(n):
   a. entity class
   b. interface class
   c. control class
   d. persistence class
   e. system class

9. What diagram depicts the life cycle of a single object?
   a. state
   b. component
   c. sequence
   d. communication

10. Which of the following statements are false about use case realization?
   a. A use-case realization describes how a particular use case is realized within the design model in terms of collaborating objects.
   b. Use-case realization is part of requirements gathering activity.
   c. Interaction diagrams and patterns apply while doing use-case realizations
   d. During construction use-case realizations are created for remaining design problems.

11. What did the Gang of Four do?
   a. create the UML
   b. popularize the use of design patterns
   c. created CRC cards
   d. created a popular object framework

12. Which of the following matters least in the use of a design pattern?
   a. The pattern's name
   b. The problem the pattern solves
   c. The source code that implements the pattern
   d. The consequences of using the pattern

13. Diagrams which are used to distribute files, libraries and tables across topology of hardware are called
   a. deployment diagrams
   b. use case diagrams
   c. sequence diagrams
   d. collaboration diagrams

14. Activity diagram, use case diagram, collaboration diagram and sequence diagram are considered as types of
   a. non-behavioral diagrams
   b. nonstructural diagrams
   c. structural diagrams
   d. behavioral diagrams

15. When a class serves as base class for many derived classes, the situation is called:
   a. inheritance
   b. hierarchical inheritance
   c. hybrid inheritance
   d. multipath inheritance
   e. none of these

16. By polymorphism of a subsystem we mean
   a. it should be reusable
   b. it should have polymorphic data types
   c. it should accept generic commands and interpret appropriately
   d. it should morph polygons

17. What is the programming style of the object oriented conceptual model?
   a. Invariant relationships
   b. Algorithms
   c. Classes and objects
   d. Goals, often expressed in a predicate calculus

18. When two or more classes serve as base class for a derived class, the situation is known as__
    a. multiple inheritance
    b. polymorphism
    c. hierarchical inheritance
    d. none of these

19. Users are typically more involved in the project during which two phases?
    a. Analysis and design
    b. Design and implementation
    c. Planning and analysis
    d. Analysis and implementation

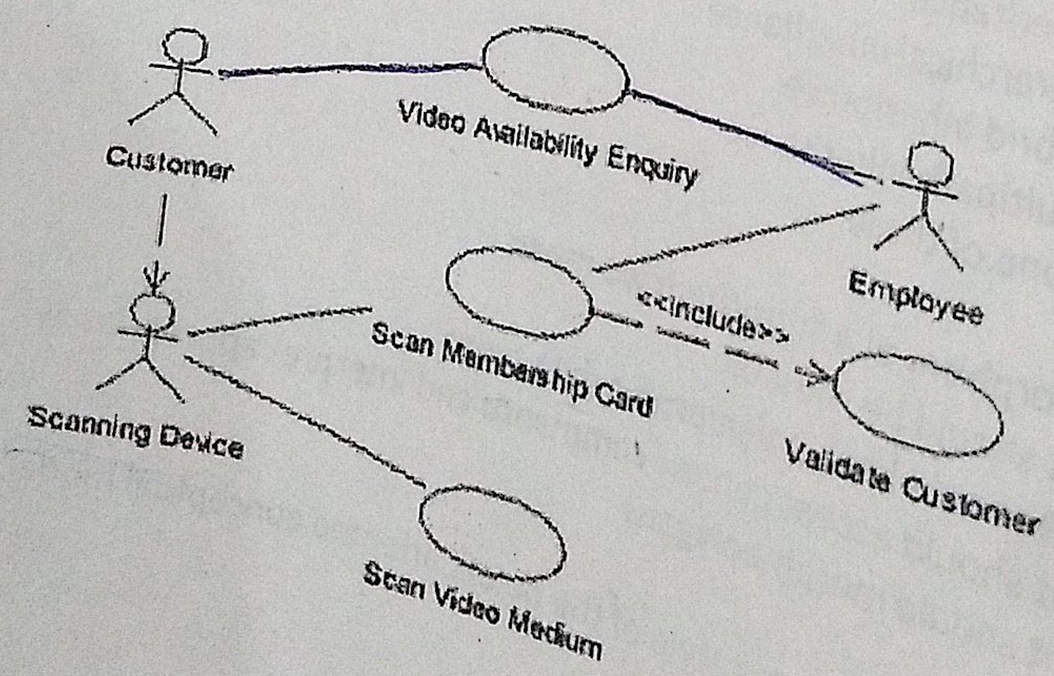
20. If you needed to provide a stable interface to similar classes with different interfaces, you could use:
    a. the singleton pattern
    b. the adapter pattern
    c. a creational pattern
    d. the factory pattern
    e. none of these

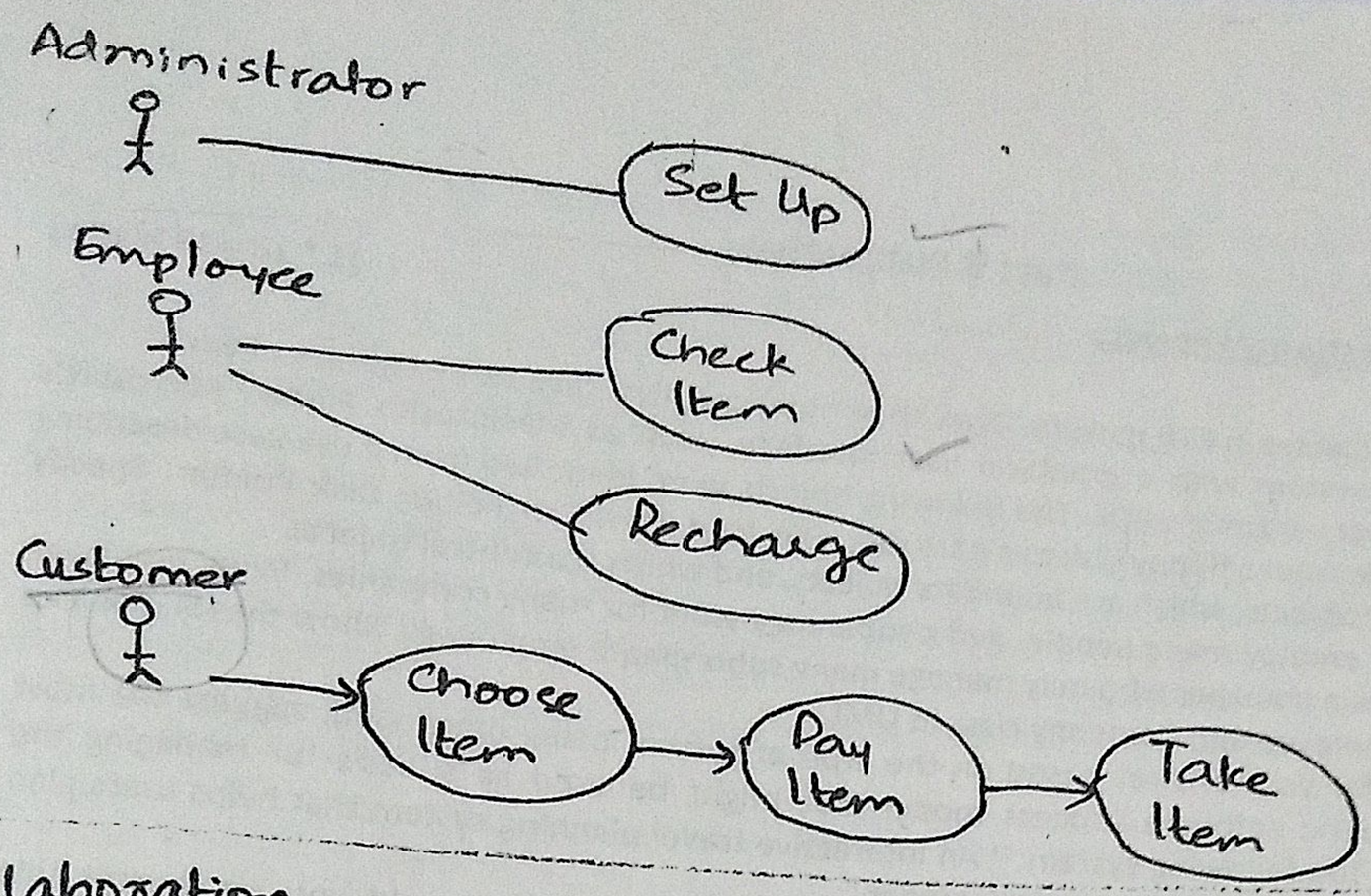
Question 1. b) **True or False.** **[0.5 * 5 = 2.5 Marks]**

1) Once the development of an increment in incremental model is started, the requirements are frozen.
2) During the validation phase of Unified Process model, software is given to end user for beta testing and user feedback reports both defects and necessary changes.
3) Agile methods seem to work best when team members have a relatively high skill level.
4) Model helps you to plan a system before you built it.
5) Unified Process (UP) is an iterative process.
6) The Unified Modeling Language is a visual language for specifying and documenting the artifacts of the system.
7) One technique for identifying behaviors is to search the use-case narrative for verb phrases.
8) GOF structural patterns provide guidance on the way in which classes interact to distribute responsibility.
9) A communication diagram is similar to a sequence diagram. But while a sequence diagram focuses on the structural organization of objects in a network format, a communication diagram focuses on timing of messages.
10) Deployment diagrams are also implementation type diagrams that describe the physical architecture of the hardware and software in the system. They depict software components, processors, and devices that make up the systems architecture.

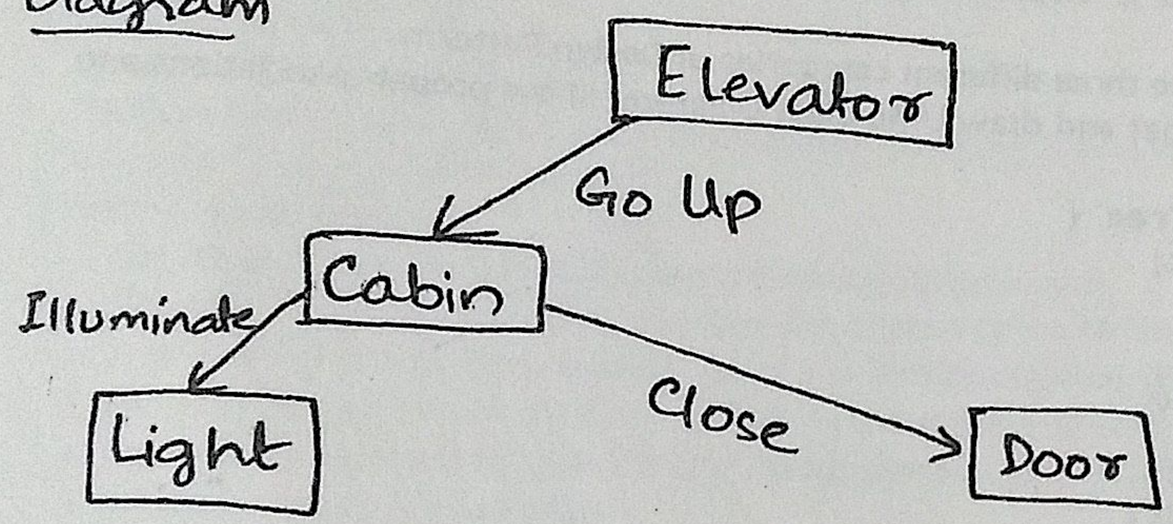
Question 1. c) **Identify the Errors (if any).**

1. **[0.5* 5 = 2.5 marks]**

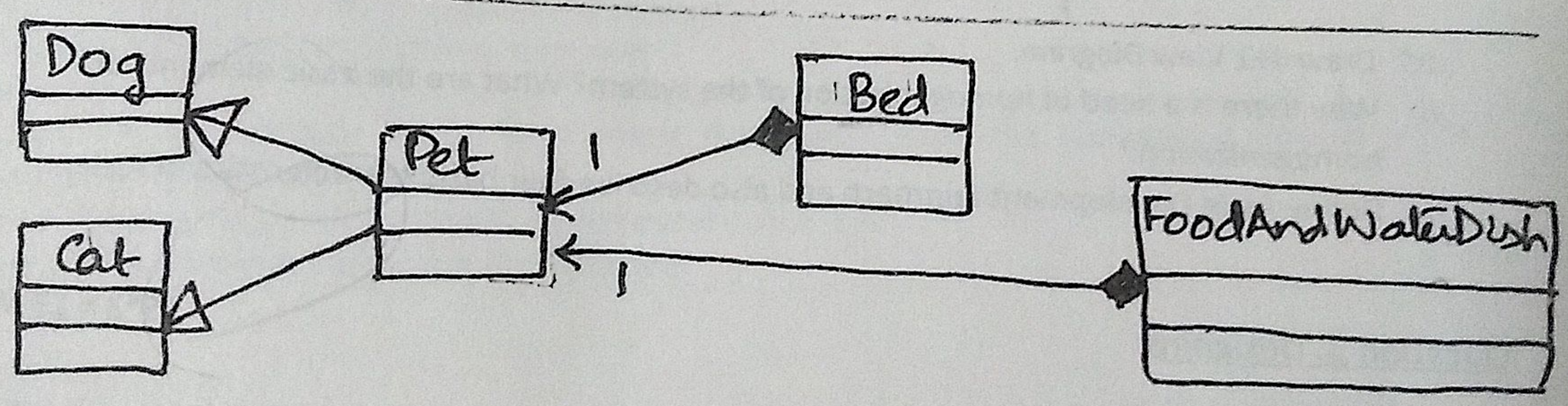




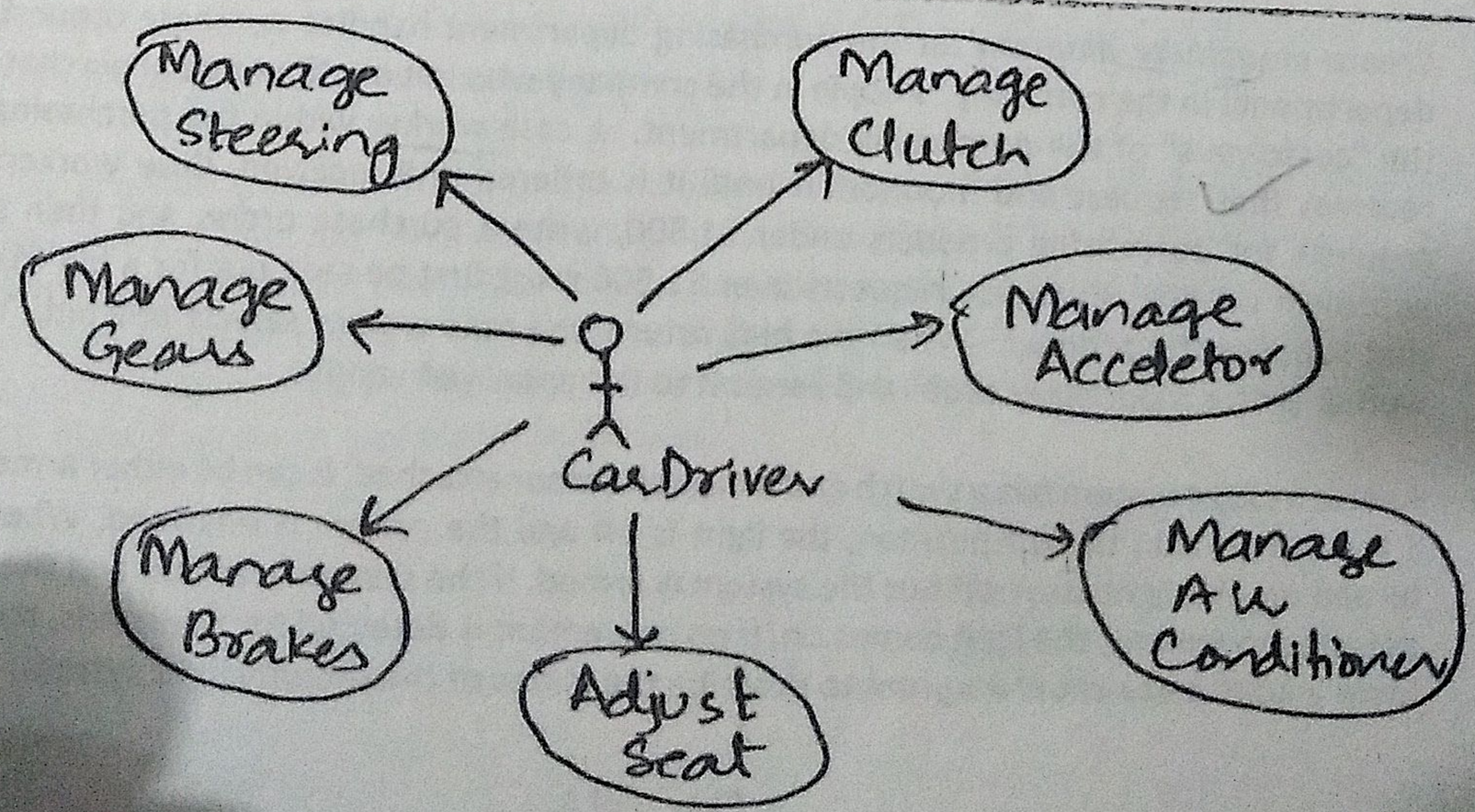
3. Collaboration Diagram



4.



5.



Part B Subjective

[1 * 10 = 10 Marks]

Question 2. Short Questions/Answers

a. Define Analysis Classes in ECB pattern. Draw their notations also. Give two examples of each.

b. Consider a file system with a graphical user interface, such as Macintosh's Finder, Microsoft's Windows Explorer, or Linux's KDE. The following objects were identified from a use case describing how to copy a file from a floppy disk to a hard disk: File, Icon, TrashCan, Folder, Disk, Pointer. Specify which are entity objects, which are boundary objects, and which are control objects.

c. Companies may employ many people, and people may work for many companies. Every employee in a company has a manager who may manage many subordinate employees. Show the relationship between the Employee and Company class in UML.

d. Giving reasons for your answer based on the type of system being developed, suggest the most appropriate generic software process model that might be used as a basis for managing the development of the following system: " An interactive travel planning system that helps users plan journeys with the lowest environmental impact."

e. Class A implements the interface B. Represent this in UML. How would you implement this relationship in Java?

f. What are Design Patterns? Describe three different categories of Design Patterns.

g. Consider the following code snippet and draw UML Class Diagram. Show proper associations and multiplicity.

```
class BinSearchTree {
public Node root;
...
}
class Node {
public int key;
public Node left;
public Node right;
...
}
```

h. Draw 4+1 View Diagram.

i. Why there is a need of homogenization of the system? What are the basic elements of homogenization?

j. Define Agile Development approach and also describe four basic characteristics of Agile.

Question 3. Designing

Attempt any three.

[5*3 = 15 Marks]

a. Create an ***activity diagram*** for the purchasing department handles purchase requests from other departments in the company. People in the company who initiate the original purchase request are the "customers" of the purchasing department. A case worker within the purchasing department receives that request and monitors it until it is ordered and received. Case workers process the requests for purchasing products under $1,500, write a purchase order, and then send it to the approved vendor. Purchase requests over $1,500 must first be sent out for a bid from the vendor that supplies the product. When the bids return, the case worker selects one bid. Then, the case worker writes a purchase order and sends it to the approved vendor.

b. A security light system has a switch and a motion sensor attached. It can be either armed or unarmed. If the switch is in the off position, the light is off and the system is unarmed. When the switch is turned on, the light stays off but the system is armed. If the system is armed and the motion sensor detects movement, the light comes on. If no movement is detected for 5 seconds, the light goes off. Draw a ***UML state-chart diagram*** to describe the states of the security light system.

c. i. Draw a fragment of UML Component diagram which shows two components Restaurant Service Web and Tax System. Restaurant service web provides three services Order Confirmation Form, Error Form and Order Item Form. Tax System provides ITaxEngine to get the computations of Tax. Tax System needs the Yearly Revenue Statement of the restaurant. You need to use the lollipop notations to model the diagram.

ii. Draw the notations of connectors used in ***UML Component Diagram***.

d. Consider the following Fully-Dressed Use Case template. Produce an interaction diagram (i.e. ***Sequence or Collaboration diagram***) for the "Record Payment" use case. The diagram should allow for both the main success scenario (single ticket, fullpayment) and the alternative scenario where only a part payment has been received against a single ticket.
Note: You are NOT required to model any other scenarios, such as payment of multiple tickets being allocated against a single payment or where the payer is not the known keeper; no additional marks will be gained for doing so.

Use Case *Record Fine Payment*
Scope *IT System*
Actor(s) *Administrator*
Goal Level *User*
Pre-conditions *Actor is logged into application;*
Post-conditions *A new payment is recorded on the system; One or several fines are updated to either be completely or partially paid off*
Main Success Scenario
1. The actor enters the first TicketID from the remittance stub
2. The system displays information about the registered owner and the specified ticket including vehicle details and a list of any other outstanding fines by vehicle
3. The actor enters the amount paid which matches the outstanding balance
4. The system displays the updated fine details (same information as step 2)
5. The actor closes the use case
Alternate flow
3a: The payment is not for the full outstanding balance
3a1: the actor enters the partial payment amount
Return to step 4
Main Scenario The payment relates to a single ticket and clears the outstanding balance - [ticket.balance = £0& status = 'paid']
Scenario 1 The payment relates to a single ticket but is only a part payment - [ticket.balance> £0& status is unchanged]

[2.5* 2 = 5 Marks]

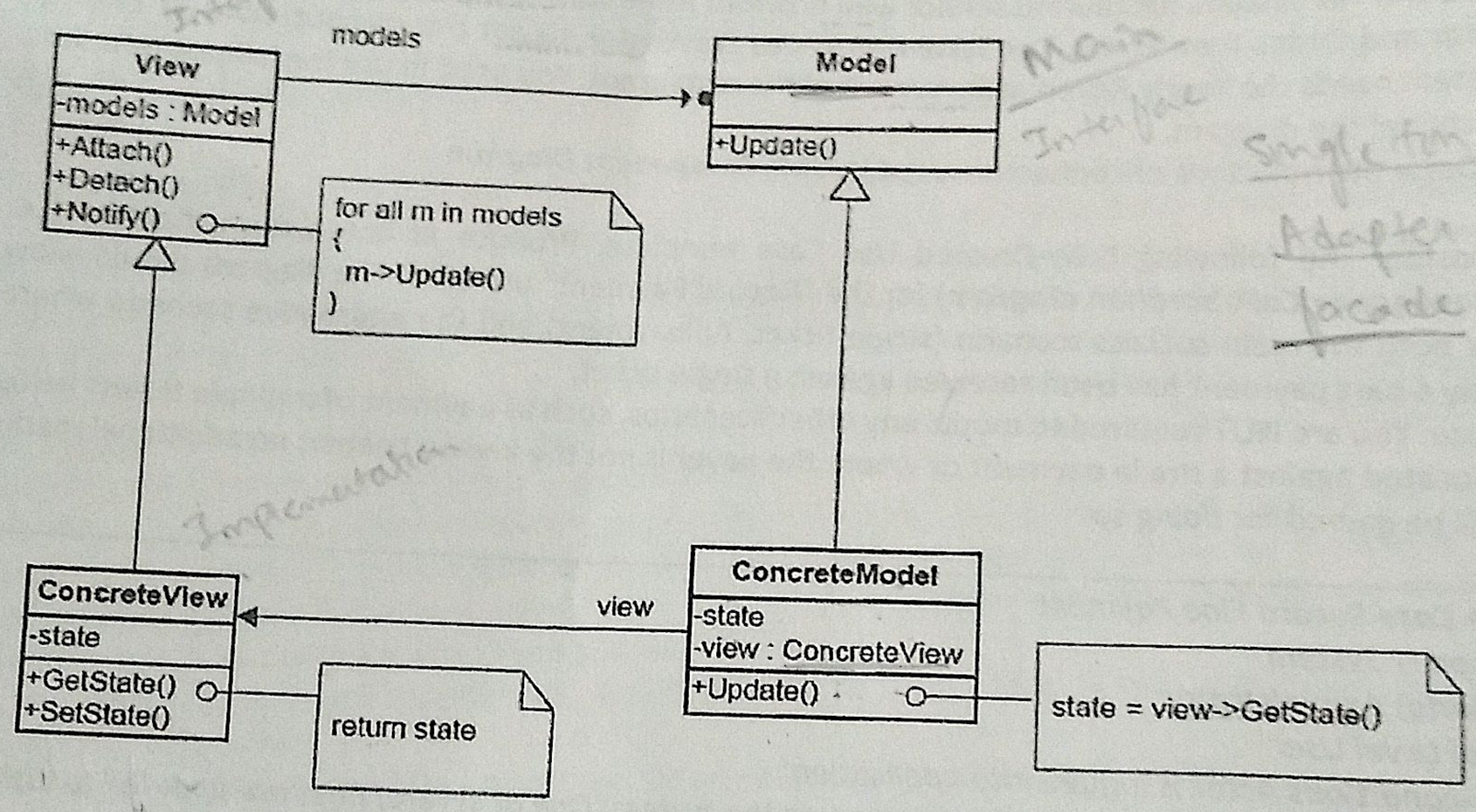
Question 04. Design Patterns

a. Suppose you need to design an application, which enables clients to book the cheapest flight to a destination of their choice from a number of providers.

Tasks:
Assume, every provider is known in advance, and implements an interface IFlightProvider, which provides operations for querying for a connection, and for booking a flight. In this application you will need a way to enable clients to interface to these providers and book the cheapest flight on offer for the destination and date they are interested in. Flight providers should require (and receive) no knowledge on other flight providers known to the system. Which design pattern could you use. Also draw the UML Class diagram to represent the pattern.

Rough Work

b. Consider the following UML diagram.



i. Identify the pattern in the diagram.
ii. Identify the participants in the diagram and indicate their responsibilities.

Best of Luck