I. Multiple Choice questions. Multiple answers may be correct. Marks will be awarded only if you mark all correct answers. No Negative Marking **[1*10=10M]**

1. Which of the following design pattern(s) does/do not belong to GoF Patterns?
(A) Factory Method
(B) Abstract Factory
(C) Factory
(D) Visitor
(E) Iterator

2. 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"
(E) A use case is an interaction between a user and a system.

3. What are the strengths of Interaction Diagrams?
(A)   when you want to look at the behavior of several objects within a single use case
(B)   they are good at precise definition of the behavior
(C)   they are good at showing collaborations among objects
(D)   they are good at exploring concurrency and multi-thread issues

4. Which of the following are false about CRC cards?
(A) During OO design, many developers use CRC cards to capture responsibilities of classes rather than constructing class diagrams
(B) Responsibilities are used to replace attributes and methods of a class
(C) Responsibility is a low-level description of the purpose of a class
(D) You are not allowed to write more than will fit on the 4x6 card
(E) CRC cards are replaced by UML interaction diagrams
(F) CRC cards encourage animated discussion among developers especially during walk-through of use cases.

5. Which of the following statements are false about State Diagrams?
(A) It is used to depict all possible states of a particular object and which event is causing the object to transition to that state
(B) More advanced State Diagrams are drawn for multiple objects
(C) UML transition syntax has 3 parts: Event [Guard] / Action, all of which are optional
(D) A guard is a logical condition that will return either "true" or "false". A guard transition occurs only if the guard returns "false"
(E) A superstate means that it contains 2 or more substates.

6. Which of the following statements is false about the goals of Inception?
(A) What is the vision and business case for the project
(B) Is it feasible?
(C) Are we going to buy or build?
(D) Provide accurate estimates of cost
(E) Produce a development schedule
(F) Get decision from management to proceed or stop

7. Which of the following statements are false about Activity Diagrams?
(A) From conceptual perspective, an activity is some task that needs to be done, whether automated or manual
(B) It is illegal to have an activity followed by another activity
(C) Activity diagram could depict parallel activities and it imposes which one should be executed first
(D) Activity diagrams are ideal for business modeling or workflow analysis
(E) Activity diagrams are not object-oriented, as their contents are not readily mapped to object models.

8. Which of the following statement is true about visibility?
(A) UML uses # for public element
(B) UML uses - for private element
(C) UML uses * for protected element
(D) UML adopts Java's convention
(E) All of the above

9. Which of the following statements are true?
(A) Within a specification model, generalization means that the interface of the subtype must include all elements from the interface of the supertype.
(B) Generalization at the implementation perspective is associated with inheritance in programming languages.
(C) Subclassing is the preferred way to implement subtyping over delegation due to high cohesion
(D) The principle of substitutability means that if I write code assuming that I have a Customer, then I can freely use any subtype of Customer such Corporate Customer or Individual Customer and everything should work fine.

10. Which of the following is/are dynamic UML diagrams?
(A) Use Case Diagrams
(B) Package Diagrams
(C) Object Diagrams
(D) Deployment Diagrams

II. State True/False for the following :   [*50% Negative* Marking] **[1*10=10M]**
1. Knowing UML means one can handle object-oriented analysis and design.
2. Class diagrams at conceptual level should include both attributes and operations
3. Associations between classes sometimes can have attributes on their own.
4. A break down of building into room, hall, lobby and so on can be represented by a generalization-specialization relationship
5. Every use case must be linked to at least one actor.
6. In a hotel reception system, an association class is needed to show the association between rooms and guests.
7. A single use case in a use case diagram always corresponds to a single activity diagram.
8. A good design pattern should be an efficient solution for a specific problem
9. If all constructors of a Java class **C** are declared to be **private**, no client of the class can create objects of type **C**.
10. An actor is anything with behavior, including the system under discussion itself when it calls upon the services of other systems

III. Write short Answers for the following questions: **[2*5=10]**
(A) What is the problem with the Adapter Design Pattern ? How do you solve it ?
(B) What are UML Stereotypes ? Provide a real world examples to use stereotypes.
(C) Compute the MIF and AIF for the below class diagram shown in Figure 1.
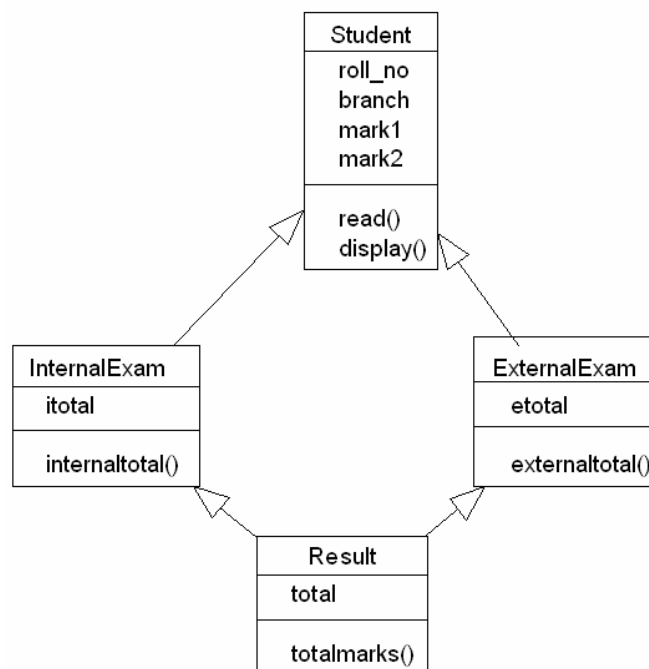
Figure 1 Class Diagram of Result Management System

(D) Name and state the design axioms with the resulting corollaries.

(E) How do we design the application logic with object in Object Oriented Design ? Justify your answer with an application.

IV. Write Answers for the following questions: [4*5=20]

(A) What do you mean by Design Smells? What are different types of Design Smells? Give two examples from each category.   What are the main causes of Design Smells?

(B) What are the coupling and cohesion metrics proposed by CK and MOOD Suite of metrics. Please state the complete formula for each of the metrics.

(C) Explain the utility of Factory Method in comparison with the constructor. Give an example with its usage in a real world scenario.

(D) Most of you have used DateFormat Class to use the date in different formats in JAVA.
- Create DateFormat instances
```
DateFormat formatter = DateFormat.getDateInstance();
Date now = new Date();
String formattedDate = formatter.format(now);
```
Discuss the usage of design pattern if any. Justify its usage or non usage.

(E) Figure 2 shows a decoration that you can apply to a component—a border. Typically, you place a border around a panel that holds related buttons. But you can apply a border to any Swing component. There are a number of classes that implement the Border interface type, such as the EtchedBorder and BevelBorder classes. Pass an object of any of these classes to the

```
setBorder method: Border b = new EtchedBorder();
panel.setBorder(b);
```


Figure 2

Discuss the usage of Decorator Pattern. Justify your answer.

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