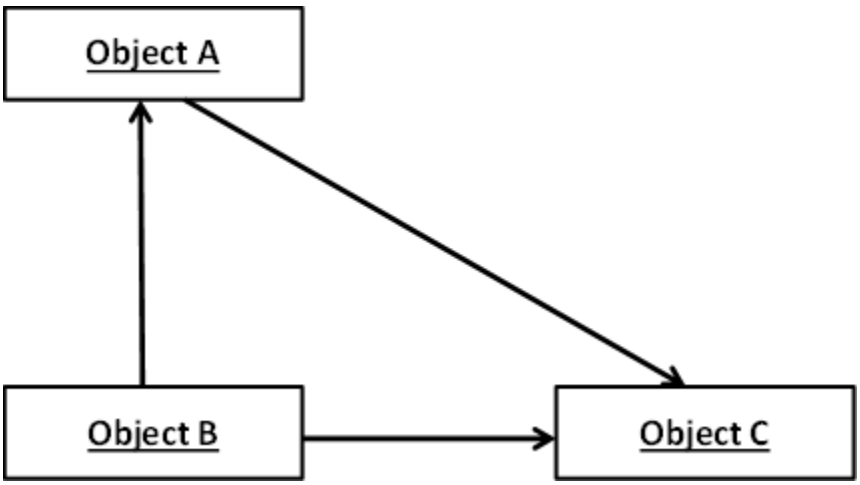
Object Oriented Analysis and Design: Assignment 3

Total Marks : 20

July 20, 2022

Question 1

Consider the following diagram.



Which objects (in that order) represent the proxy object, active object and the server object respectively?

Marks: 2 **MCQ**

a) `ObjectA`, `ObjectB`, `ObjectC`

b) `ObjectA`, `ObjectC`, `ObjectB`

c) `ObjectB`, `ObjectA`, `ObjectC`

d) `ObjectC`, `ObjectB`, `ObjectA`

Answer: a)
Explanation: `ObjectA` is operated on by `ObjectB` and operates `ObjectC`. So, it is called the proxy object
`ObjectB` operates `ObjectA`, and `ObjectC` but is not operated by any object. So, it is called the client or the active object .
`ObjectC` is operated by `ObjectA` and `ObjectB` but does not operate any other objects. So, `ObjectC` is called the server or passive object.
So, option (a) is correct.

Question 2

In all the following options, the class mentioned before comma is inherited from the class mentioned after comma. Which of the given inheritance represent(s) inheritance for restriction?

Marks: 2 **MSQ**

a) Triangle, Shape

b) Ostrich, Bird

c) Queue, List

d) Flower, Petals

Answer: (b), (c)
Explanation: A triangle has more properties (like isosceles, equilateral etc.) and methods than a Shape.
An Ostrich does not have a method like `fly` which should be available in a Bird class.
A queue does not have methods like `addAtBeginning`, `deleteAtEnd` which are desirable in a List class.
There is no inheritance relationship between a flower and petal.
Hence, options (b) and (c) are correct.

Question 3

A `Node` object in a `binary tree` contains two properties: `next_node`, and `data`. Identify the common operation that will be used to print the `data` of the remaining list from any given `node`.

Marks: 2 **MCQ**

a) Modifier

b) Selector

c) Iterator

d) Constructor

Answer: c)
Explanation: The method has to traverse the list in some manner to print the data of each node of that list. So, it is an `iterator` method.
Hence, option (c) is correct.

Question 4

Which of the following pairs of entities represent(s) strong aggregation or composition relationship?

Marks: 2 **MSQ**

a) Aeroplane, Wings

b) Hospital, Doctor

c) Bat, Bird

d) Human being, heart

Answer: a) , d)
Explanation: An aeroplane object contains two wings and one wing is completely owned by some aeroplane. Hence, it represents strong aggregation.
A doctor object may be associated with many hospitals at the same time. Hence, this is an example of weak aggregation.
Bat and Bird objects are not connected by any aggregation relationship.
A human being object contains a heart and the heart is completely owned by a human being. Hence, it represents strong aggregation.
So, options (a) and (d) are correct.

Question 5

A `Node` object in a `binary tree` contains two properties: `next_node`, and `data`. Identify the common operation that will be used to check whether the `node` is the last node or not.

Marks: 2 **MCQ**

a) Modifier

b) Selector

c) Iterator

d) Constructor

Answer: b)
Explanation: The method has to access the state of the node. Specifically it has to check whether its `next_node` is null or empty. So, it is a `selector` method.
Hence, option (b) is correct.

Question 6

Which of the following statements is (are) incorrect about coupling and cohesion?

Marks: 2 **MSQ**

a) Cohesion is the measure of strength of association between classes.

b) A class that contains a collection of public and static functions which are accessible from different classes has a very low cohesion.

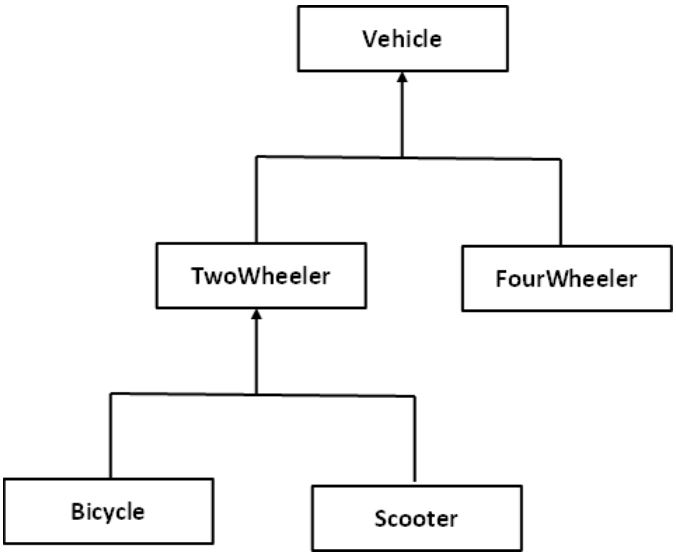
c) An object of class `A` passes an object as an argument to an object of class `B`. this is the worst type of coupling.

d) A public interface `void int getTop()` in the class `Stack` that returns the index value of the top element in the array of the `Stack` object; this is an example of common coupling.

Answer: (a), (c)
Explanation: High cohesion means that a class does a well defined job. Coupling is the measure of strength of association between classes.
The class in option (b) is low cohesive.
The kind of coupling in option (c) is called data coupling which represents the relation `uses` between classes `A` and `B`. This is the simplest form of coupling. In the coupling of option (d), the implementation of the class `Stack` becomes exposed. This is an example of common coupling.
So, the statements in options (a) and (c) are incorrect.

Question 7

Consider the following class diagram.



Suppose that all classes have two methods called `start()` and `stop()`.
What property do these methods demonstrate?

Marks: 2 **MCQ**

a) Abstraction

b) Encapsulation

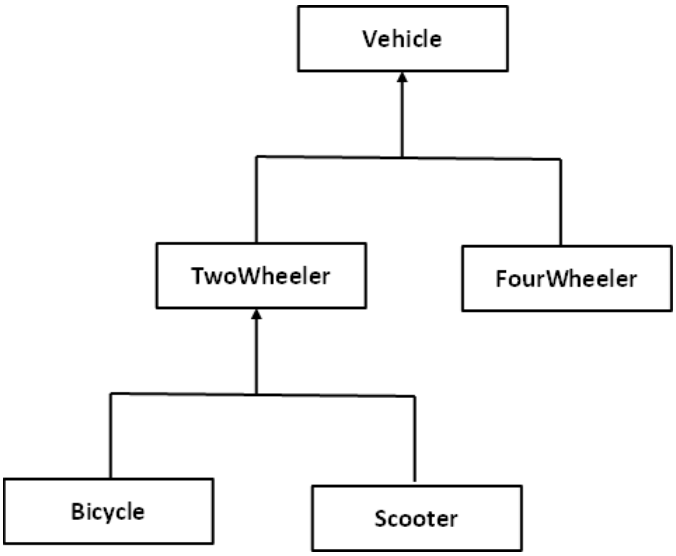
c) Inheritance

d) Polymorphism

Answer: (d)
Explanation: For all classes, the names of the methods are the same but their behaviour is different.
This is called polymorphism. Hence, option (d) is correct.

Question 8

Consider the following class diagram.



In which class the method `getNumberOfWheels()` cannot return the true number of wheels of that car?

Marks: 2 **MCQ**

a) Vehicle

b) Scooter

c) Bicycle

d) FourWheeler

Answer: (a)
Explanation: The method `getNumberOfWheels()` cannot be properly defined in the class `Vehicle` because this method cannot be defined for a general vehicle.
Hence, option (a) is correct.

Question 9

In each of the following options, three objects are described. Identify the option in which the objects cannot be said to be instances of the same class.

Marks: 2 **MCQ**

a) {1.0, 3.5, 5.2}, {3.1, -4.5, 5.4}, {-2.7, 1.2, 3.7}

b) {John, CSE, IIT}, {Kyan, ECE, NIT}, {Plaban, Physics, IISER}

c) {Kolkata, West Bengal, India}, {Brasília, Brazil, South America}, {Tokyo, Japan, Asia}

d) {lily, 3 petals, {white, yellow, pink, red, orange}}, {buttercup, 5 petals, {midtone, pure, glow stick yellow}}, {aster, 21 petals, {white, purple, blue, pink}}

Answer: (c)
Explanation: Objects in option (a) may be instances of `3DPoints` class.
Objects in option (b) may be instances of `Student` class.
Objects in option (d) may be instances of `flower` class.
Objects in option (c) do not have a common structure. So they cannot be instances of one class.
Hence, (c) is the correct option.

Question 10

Which of the following denotes relationship among objects in ascending order of strength of coupling?

Marks: 2 **MCQ**

a) `Inheritance`, `Aggregation`, `Simple Association`

b) `Aggregation`, `Simple Association`, `Inheritance`

c) `Simple Association`, `Inheritance`, `Aggregation`

d) `Simple Association`, `Aggregation`, `Inheritance`

Answer: (d)
Explanation: Inheritance is the strongest coupling followed by aggregation followed by simple association. Hence, option (d) is correct.